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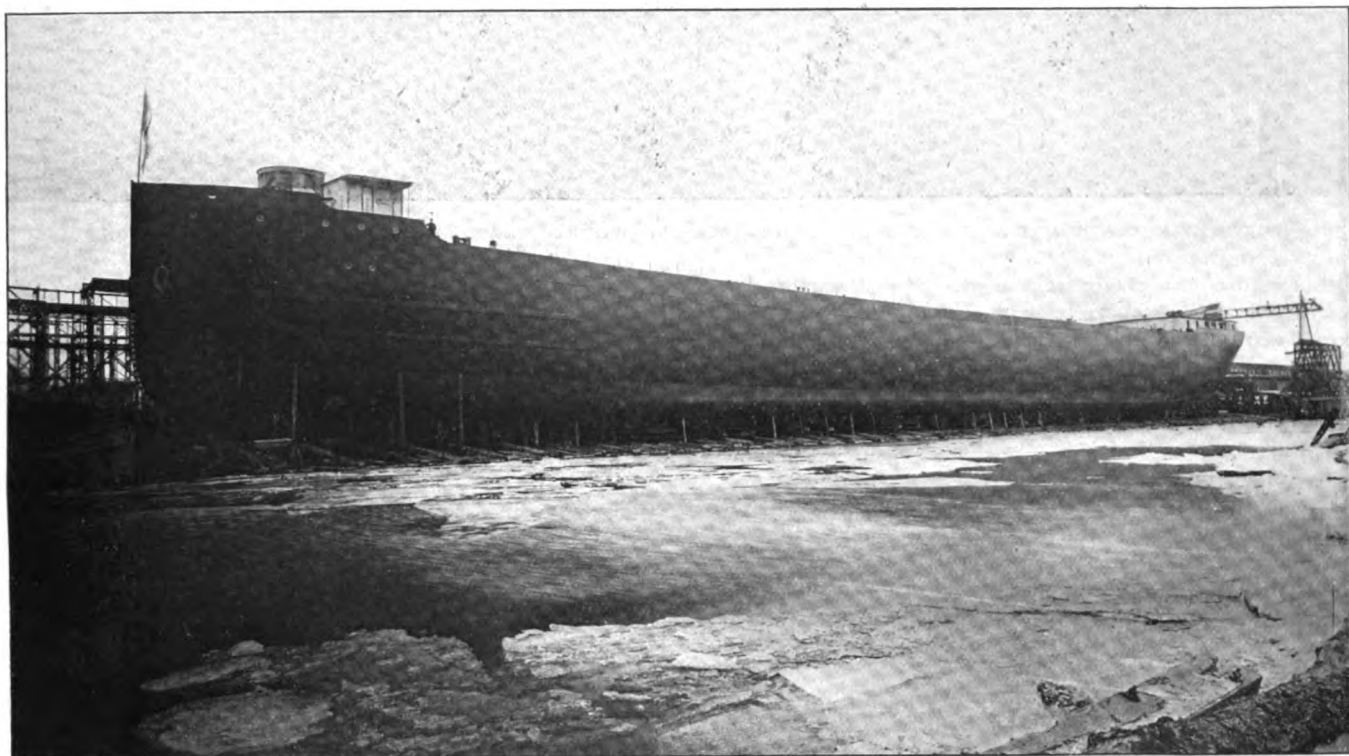
CLEVELAND, O., DECEMBER 29, 1904.

No. 26.

LAUNCH OF A TOMLINSON STEAMER

The first of the five steamers building for Mr. G. A. Tomlinson of Duluth was launched from the Lorain yard of the American Ship Building Co. on Thursday last. Mr. Tomlinson departed from his usual custom of naming his fleet with words beginning with "S" and ending with "A," by christen-

there are elements of great danger in every launch. The launching party went to Lorain on a special car and returned immediately thereafter. The guests were: Prof. W. J. Mauck, Hillsdale, Mich.; Miss Joy Mauck, his daughter; Miss Helen Mauck of Portland, O.; Mr. and Mrs. G. A. Ball of Muncie, Ind.; Mr. G. A. Tomlinson of Duluth; Miss Ball of Clevel-



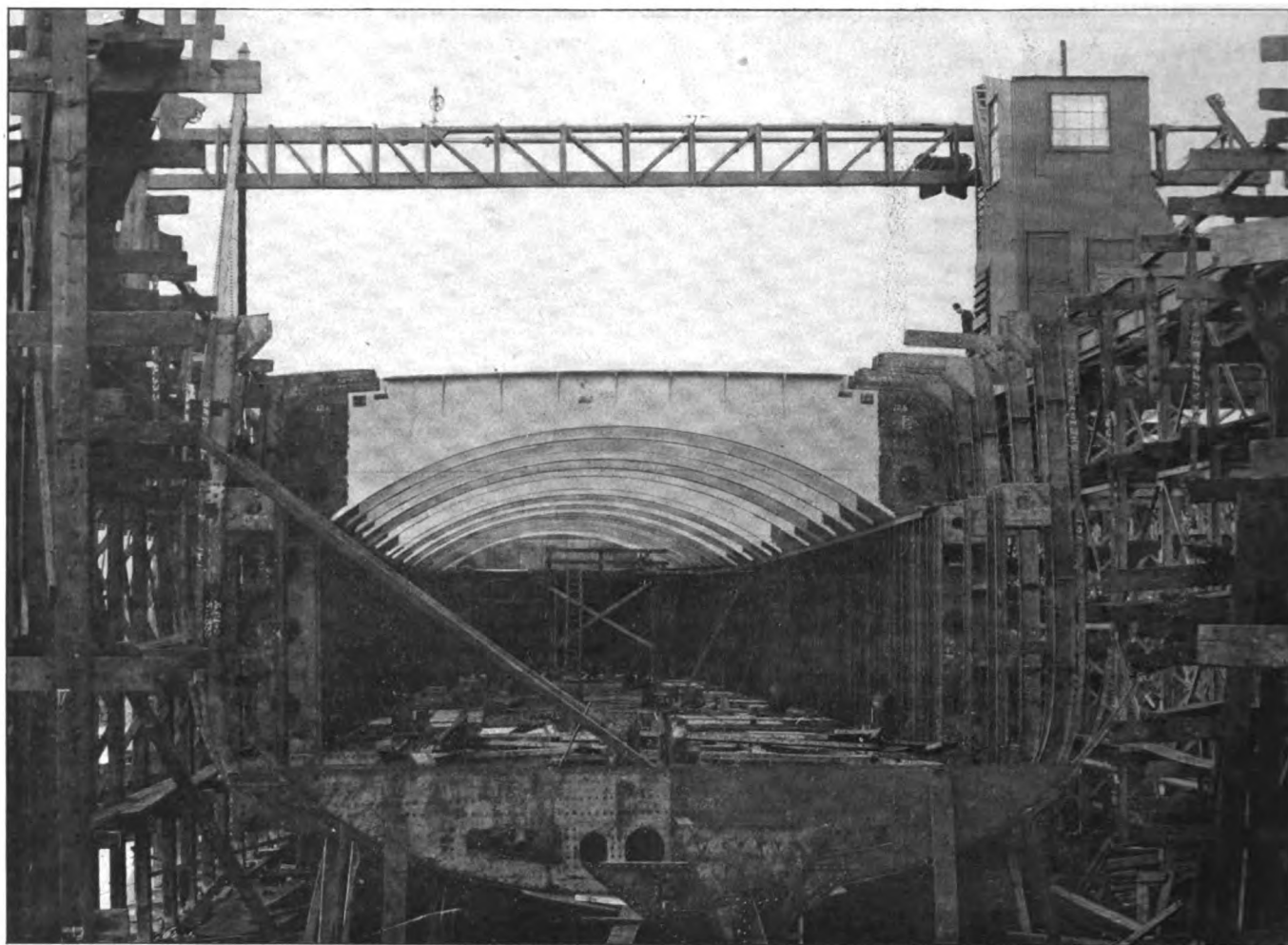
THE LATEST TOMLINSON STEAMER BALL BROTHERS ON THE STOCKS JUST PRIOR TO BEING LAUNCHED.

ing the new vessel Ball Brothers in honor of three of the principal stockholders in the Globe Steamship Co., owners of the vessel. The name was not decided upon until the very last minute and painters were sent to chalk it upon the bow just before the vessel was released from the ways.

The new steamer, which is the smallest of the quintet building for Mr. Tomlinson, was christened by Miss Joy Mauck, daughter of Prof. W. J. Mauck of Hillsdale, Mich., president of Hillsdale college. As usual with launches by this company it was conducted with such smoothness as to cause one to wonder why launches are ever considered dangerous; yet

land; James E. Davidson and Harold Davidson of Bay City, Mich.; George Coleman of Bath, Me.; Edward Smith of Buffalo and Mr. Robert Wallace, James C. Wallace, R. C. Wetmore and Robert Logan of the American Ship Building Co. and W. H. McGean of Cleveland.

The Ball Brothers is built upon the arch system of construction, that is to say, in the substitution of the arch girder plate for stanchions. These girder plates are fastened athwartship between the hatches to web frames. This system of internal construction is intended to facilitate the loading and unloading of vessels since it forms a continuous hold un-



THE TOMLINSON STEAMER BALL BROTHERS ON THE STOCKS, SHOWING THE ARCH GIRDER SYSTEM OF CONSTRUCTION.

obstructed by stringers or stanchions. The steamer is 500 ft. over all, 48 ft. keel, 52 ft. beam and 30 ft. deep and will have a carrying capacity of 8,600 tons. She will be propelled by triple-expansion engines with cylinders $22\frac{1}{2}$, 36 and 40 in. diameters by stroke of 42 in. Steam will be supplied by two Scotch boilers 13 ft. 9 in. in diameter and $11\frac{1}{2}$ ft. long, fitted with Ellis & Eaves draft. She will be ready by the opening of navigation.

Two more steamers are building for Mr. Tomlinson at the West Bay City yard of the American Ship Building Co. and two at the Ecorse yard of the Great Lakes Engineering Works. The first of the Tomlinson steamers to be launched at the yard of the Great Lakes Engineering Works, Detroit, will be named after Mr. James E. Davidson of Bay City who is Mr. Tomlinson's brother-in-law.

THE BELLEVILLE BOILER

The machinery performances of his majesty's ship *Terrible* during her recently completed voyage to Wei-hai-wei and back, now carefully collated, afford noteworthy commentary on the communication made by Admiral Sir Compton Domville in connection with the boiler committee's final report. Sir Compton Domville, it will be remembered, referred to the great improvement effected in the working of the Belleville boiler, and the voyage of the *Terrible* proves this most convincingly. This ship, launched in 1895 from the Clydebank works of Messrs. John Brown & Co., recently underwent a complete overhaul, and steamed this year to China and back at deeper draught and at faster speed for one-half the consumption of coal required in the same voyage two years ago. In 1902 she steamed home from Wei-hai-wei

to England, a distance of 11,045 sea miles, at a mean speed of 11.8 knots, for an expenditure of coal of 11,163 tons, including all purposes and even harbor requirements. This year the round voyage to China and back, a distance of 21,741 sea miles, was accomplished at a mean speed of 12.6 knots for a total consumption of coal of 10,092 tons. The coal actually used for propulsion worked out at 1.78 lbs. per hour per indicated horse power developed by the main engines, as compared with 2.9 lbs. in the voyage two years ago. With a mean draught of 27 ft. 3 in., as compared with 26 ft. 7 in., and notwithstanding that a much longer time had elapsed since the vessel had been drydocked for cleaning the hull, and, although the rate of speed was 0.8 sea miles per hour greater, this year's voyage was thus accomplished with a fuel consumption for all purposes equal to one ton per 2.34 miles steamed, against 1.22 miles. Taking the coal for the main engines only, the coal used equalled one ton per 3.37 miles steamed, as compared with 1.55 miles two years ago. The result is thus exceptionally satisfactory for its economy. Engineer-Com. A. W. Turner, who was in charge of the engines of the *Terrible*, was the first naval engineer to go to sea with Belleville boilers in a British ship, as he was with the *Sharpshooter*.

The United States civil service commission will hold an examination on Jan. 25-26 to fill vacancies in the positions of local and assistant inspectors of boilers in the steamship inspection service. Applicants should at once apply for the necessary papers to the commission at Washington, D. C. The places at which vacancies occur embraces nearly one-half of the states in the union.

LIVERPOOL SHIPPING LETTER

Some Remarkable Facts and Figures about Liverpool's Shipping Trade

Liverpool, Dec. 19.—Reviewing the past year's working of the Liverpool dock estate, Mr. Robert Gladstone, president of the Mersey Docks and Harbor Board, observed that it was extremely probable that a new dock or docks would be constructed on land at the north of the Hornby dock which was being cleared for the purpose. Touching upon what the board had done during the year in regard to dredging, he mentioned that the total quantity of sand which had been removed from the bar and the sea channels since 1890 amounted to 82,000,000 tons. They had removed that enormous quantity of sand and thereby improved the approaches to the port at a cost of \$150,000 a year. There was a prospect of more mills being erected near the docks, and there were people who stated—he dared say they were right—that cotton mills were to be set up in Liverpool. The petroleum trade continued to increase, the grain trade was in a very satisfactory state, the corn warehouses were crammed full, more coal was shipped in Liverpool for use on foreign bound steamers than in any other port in the United Kingdom, and their stock of tobacco in warehouses was the largest they had ever known, amounting to upwards of 125,000 hogsheads, and representing a value duty paid of about \$125,000,000. As to the statement which had been made that Liverpool was a decaying port, he had obtained figures from official returns which showed that the total increase in the value of imports and exports of the United Kingdom in the year 1903, as compared with 1899 was 10.8 per cent, representing a money value of about \$450,000,000. Of that increase Liverpool had 4.4 per cent, London 1.9 per cent, Manchester 1.2 per cent, Glasgow .8 per cent, Southampton .8 per cent, Bristol .3 per cent, Leith .2 per cent and Hull .1 per cent. Percentages were not always intelligible, but in money they meant that while London had increased \$79,000,000 Liverpool showed an increase of \$180,500,000. The increase in the trade of Liverpool was equal to that of London, Manchester, Glasgow, Bristol and Hull added together. All he could say was that a few more years of similar decay would put them at the head of the ports of the world. Referring to the oft repeated statement that the tonnage going into Hamburg was much in excess of that going into the port of Liverpool, he pointed out that during the past twelve months the tonnage that went into the port of Hamburg was 9,124,000 tons, while in Liverpool in the same period it was 12,445,000. As to dock dues he stated that if last year they had charged the same dues as twenty years ago, their income would have been \$1,708,000 more than it was at present, to such an extent had the dues been from time to time reduced. He was satisfied that if any of their great steamers left Liverpool, it would not be on account of dock dues. It might be said that it was, but it would not be true.

Messrs. Andrew Weir & Co. of Glasgow, it appears, have been awarded the contract for the new British steamship line between British Columbia and Mexico. This firm agrees to put on the service first-class steamships, capable of carrying 4,500 tons of freight each, and fifty first-class and from 300 to 400 steerage passengers. It is definitely arranged that the port of embarkation will be Vancouver, and that Victoria will be a port of call. As yet no positive steps have been taken regarding the calling of these vessels at any American port en route to Mazatlan and Acapulco, although correspondence is in progress to induce them to call at San Diego, Cal. The steamers will carry the British flag, and are to make monthly trips. It is expected that the first vessel will arrive in time to make the first sailing from Vancouver about January, 1905. The contract runs for five years, and the line receives subsidies from both the Canadian and Mexican governments, \$50,000 per annum from each. The great growth of the exports

from Mexico to the United States which increased from \$6,500,000 in 1880 to \$42,250,000 in 1903 has been largely the cause of subsidizing this line, and every effort will be put forth to divert a portion of Mexican trade from the United States to British Columbia.

An important conference of commercial men from all parts of Great Britain who favor a scheme for making British canals more useful in the interests of trade has just been held in London. It was stated to the conference that British canals not owned by railway companies have a capital of nearly \$190,000,000, and the proportion of profit was \$1,080 per mile on a traffic of 33,000,000 tons. On the other hand the railway-owned canals of nearly half the length carried only 6,000,000 tons of traffic, and their net profit was only \$200 per mile. It was deemed by the conference desirable in the public interest that the canals and inland waterways of the United Kingdom, exclusive of any trading interest in respect of carriage or warehousing of merchandise, should be vested in a public trust with a government guarantee, and that the government be asked to promote or give facilities for a bill in the next session of parliament for the purpose.

The December report of the Boilermakers' and Ship Builders' Society, referring to the recent wages dispute on the north-east coast of Britain expresses pleasure that a bitter struggle was avoided by the good sense of the men. The report states that the full limit of endurance regarding reductions of wages has now been reached and it is hoped that the lowest ebb in depression, which has now lasted three and a half years, has been reached, and that a revival of trade will before long enable them to retrieve their position. The report shows a greater number of unemployed on the books than during any previous period of trade depression. The members receiving out-of-work benefits total 7,112, as against 6,790 a month ago. In addition, 2,059 members are on the sick list, and 1,170 are superannuated. The total on the funds is therefore 10,341, as against 9,964 last month, over 21 per cent of the society's members.

In the list of sailings of the Antwerp and New York service of the Red Star Line recently issued, which forms a part of the International Mercantile Marine Co., it is announced that the steamers will call at Dover on the outward and homeward journeys. The steamers comprise the well known twin-screw vessels, Finland of 12,760 tons, Kroonland of 12,760 tons, Vaderland of 12,018 tons, and Zealand of 11,905 tons. The Antwerp and Philadelphia and Boston services of the company have been augmented by the addition of the Kingstonian, Oxonian and Etonian of the Leyland Line.

The Canadian Steamship lines are returning to the original rates which prevailed before the commencement of the Atlantic rate war. The Dominion Line has issued the following circular to its agents: "Winter service to Halifax and Portland.—Kindly note for annexed sailings for Halifax and Portland, the third-class ocean rate is \$27, but if a lower rate should be ruling at the time of sailing the difference will be refunded. This will enable agents to book ahead for spring sailings without risk of disadvantage to the passenger." The sailings referred to commence on Feb. 9 and apply to the steamers Dominion, Canada, Southwark, Kensington and Vancouver. The third-class fares by the Allan Line royal mail steamers and the Canadian Pacific Railway Atlantic Steamship Line will also be advanced to \$27 after the end of January.

Satisfactory progress continues to be made with the building of the express turbine Cunarder on the Clyde. Experiments affecting various parts of the vessel are still being conducted, and quite a mass of important detail of construction still remains to be finally decided upon. For instance, the exact position of the funnels have not yet been resolved upon. At first it was intended that the same space should separate the

first and second, and the third and fourth funnels, and that there should be a greater space between the second and third. Now a proposal or suggestion has been made that there should be a uniform distance between all four. So far as actual work on the vessel itself is concerned progress is being made slowly. The counter may be said to be fully laid and the first frames are in position.

Within a little over four months Messrs. Denny Brothers of Dumbarton have launched the four turbine mail steamers—the Lhasa, Linga, Lanka and Lama—they had an order for the colonial trade of the British India Steam Navigation Co., the last on the stock, the Lama, having been floated a week ago. The three first named were supplied with turbines by the Parsons' Marine Steam Turbine Co., Messrs. Denny & Co. providing the boilers and other machinery, while in the case of the Lama, the whole work is being done by Messrs. Denny Brothers. It is intended that the vessels will engage in the Bombay-Kurrachee mail service, and their appearance in the east will mark the advent there of turbine propulsion. Speed is a matter of great moment in the route, and the vessels have accordingly been designed on very fine lines, and in no way as cargo carriers. There is, however, accommodation for a limited amount of cargo. Provision is made for first and second saloon passengers, and the main decks have been arranged for the carrying of natives. The British India Co. have also building for them by Messrs. William Doxford & Sons, Ltd., Sunderland, three 12,000-ton turret steamers, and these it is said will also be put on the eastern service as coal carriers.

The turbine machinery for the new Allan liner Victorian—the most powerful turbine engines that have yet been built—have been completed at the works of the Parsons' Marine Steam Turbine Co., Wallsend-on-Tyne. They have just been shipped to Glasgow where they will be fitted on board, and it will not be long now before the first Atlantic turbine steamer is ready to take her trial trip, and essay the passage to America. Her speed performances and general behavior at sea will be watched with the keenest interest by engineers, for up to the present no ship bigger than a third-class cruiser has been fitted with turbine machinery, and the Victorian is a liner of almost mammoth proportions.

Despite the reduction of 50 centimes per ton, which was made at the beginning of 1904, the Suez canal earnings are very satisfactory. For the month of November the returns from traffic received by the canal company amounted to, roughly speaking, \$2,062,000, against \$1,880,000 in November, 1903, and \$1,662,000 in November, 1902. During the past eleven months 3,814 ships have passed through the canal paying \$20,933,500, which compares with 3,445 ships paying \$18,900,000 in 1903, and 3,416 ships paying \$19,072,500 in 1902. Concerning the dispute between British ship owners and the Suez Canal Co., Sir Theodore Angier, head of the well known shipping firm of Angier Brothers, has stated that all plans are completed for the cutting of a second canal through the isthmus of Suez. Contractors were prepared to begin at any moment, and it would certainly be done unless British cargo vessels received fairer treatment from the present canal company directorate.

At a meeting of the creditors and attorneys of the Neafe & Levy ship yard an approximate statement of the firm's liabilities and assets was presented. It showed \$1,192,808 in assets against \$454,000 in liabilities. It was unanimously decided to allow the receivers, John W. Grange and Sommers N. Smith, full power to act as they see fit.

The Lackawanna railway ferry boat Scranton, recently completed at the Newport News ship yard, had her trial trip and was found most satisfactory. She attained a speed of 15 knots which, of course, is a most unusual speed for a ferry boat. The Newport News company is also building three others, like the Scranton, for the Lackawanna railroad.

PLANS FOR THE PANAMA CANAL

Mr. John F. Wallace, chief engineer of the Isthmian canal commission, has given the house committee on interstate and foreign commerce the benefit of his investigations, so far as made, regarding the engineering tasks to be performed in the construction of the Panama canal. The testimony was taken aboard the army transport Sumner in Colon harbor, on the occasion of the recent visit of the committee to the canal zone. It is to be printed for the use of congress. Advance information concerning it is as follows:

"The instructions to the chief engineer by the present commission were to make full and thorough examinations of the canal route, the manner of doing the work and the various plans which might suggest themselves, and lay before the commission the result of this examination with his final recommendation. The first plan to be considered, the one estimated upon by the former commission, is the possibility and practicability of a high dam, or proper foundation for a high dam at Bohio, upon which depends the advisability of constructing a high level canal, with the surface of the water to 90 ft. above sea level. The second plan under consideration is a summit level of 60 ft. above sea level. Constructing a canal on this plan admits of two different methods of treatment: First, the construction of a dam 60 ft. above sea level at Bohio, with two locks of 30 ft., there being two locks on the western slope. Second, the construction of a dam 60 ft. above sea level at Gatun, 8 miles from Colon, with two 300-ft. locks in the same vicinity. The adoption of a 60-ft. level also will render it necessary to construct a dam at Gamboa, in order to accumulate water enough during the wet season to furnish water for the summit level of the canal. The construction of a dam at Gamboa, in this connection, would also control the Chagres river, except that it would be necessary to provide a safety spillway by the construction of a tunnel some eight miles in length through the divide, discharging waters of the Chagres into the head waters of the Juan Diaz or the alternative plan of constructing a tunnel four miles long through the divide separating the Chagres basin from the headwaters of the Gatuncillo, a stream which enters into the Chagres valley at Gatun. Should this latter course be adopted it would be necessary to construct an auxiliary channel for the Chagres from Gatun to the sea, in order to divert its flood waters into the bay eastward of Colon. The third general plan under consideration would be the construction of a canal with a 20-ft. or 30-ft. level above the sea, with a single lock at Miraflores, and a single lock at Bohio, or in the immediate vicinity; the construction of the Gamboa dam to be required in this instance the same as in the 60-ft. level plan.

"The fourth plan would be the construction of a sea-level canal with a tidal lock at Miraflores. In this connection it is necessary to explain that while the mean sea level of the Pacific and the Caribbean are the same, high tide in the bay of Panama rises 10 ft. above mean sea level and falls 10 ft. below; whereas, the fluctuation of the tide of the Caribbean at Colon is less than 2 ft. The construction of a dam at Gamboa, with the necessary spillways, as noted in the previous plan, would be the same under the sea-level plan as under the 30 or 60-ft. level. The construction of the Gamboa dam would provide the water supply for the entire line of the canal, including the cities of Panama and Colon. It would also provide a power plant for the generation of electric power sufficient to furnish ample power for the operation of the Panama railroad and for the operation of any machinery that might be used in the construction of the canal. It would require two years to construct this dam, and, roughly estimated, its cost, including spillways, would be between \$15,000,000 and \$16,000,000, not including the power plant."

Asked by members of the committee for an estimate of the cost of the various plans, Mr. Wallace said the best estimate that could be made at present would be based on the estimate

of the former commission, of \$200,000,000 for a 90-ft. level canal. Figuring with this as a basis, the 60-ft level canal would cost \$225,000,000, when it is open for traffic in ten years and fully completed in twelve years; the 30-ft. level would cost \$250,000,000, open for traffic in twelve years and fully completed in fifteen years; the sea-level canal would cost \$300,000,000, could be open for traffic in fifteen years and completed in twenty years.

Chairman Hepburn's questions developed that the estimate of time to build the canal was based on a ten-hour day, and that with the construction of the Gamboa dam and the operation of the power plant, electric light sufficient to illumine the whole of the Culebra cut might be had, thus making practical the working of two or more shifts, and shortening the time of construction. Mr. Wallace stated that the excavation of this cut was the feature of the construction of the canal that took the time. He said:

"Upon the economical and efficient handling of the material from Culebra cut depends the cost and the time it will take to complete the canal. Every other question and every other problem connected with the entire work is subordinate and inferior to the problem of the excavation and disposal of the material from the Culebra cut; that is the principal problem of this work."

Work is now going on in the cut, one American steam shovel and some of the French machinery being in operation. Fourteen American steam shovels have been purchased, one of which is being set up. The others are to be delivered at the rate of one a month. During October 3,185 men were on the pay rolls of the commission. Of these 2,165 were laborers receiving 15 cents silver an hour, 245 laborers receiving 17½ cents an hour; 775 were machinists, boilermakers, pipe fitters, plumbers, carpenters and masons; 256 were Americans from the United States, whose compensation is paid in gold, and who fill positions as engineers, clerks and foremen. More laborers are to be employed in the immediate future. Mr. Wallace is somewhat doubtful of the practical working of the civil service order, as recently applied to canal employees.

IRON ORE ON LAKE ERIE DOCKS

The figures compiled from the returns sent in by the various dock companies show that iron ore receipts at Lake Erie ports during the season of 1904 were 17,794,598 tons. Out of the total movement of ore by lake of 21,226,591 tons on Dec. 1 Lake Erie docks hold a balance of 5,669,895 tons. During 1903 the total output by lake was 23,649,550 tons of which Lake Erie docks received 19,681,731 tons and held a balance on dock Dec. 1 of 6,371,085 tons. In 1902 they received a balance of 22,694,425 tons and held a balance on dock Dec. 1 of that year of 7,074,254 tons. The balance on dock, therefore, Dec. 1 this year, is considerably less than it was for the two previous years but it is undoubtedly ample for furnace consumption this winter. Never in the history of the trade has so large an amount as 5,000,000 tons gone forward from dock to furnace during the winter season and it is not expected that all of this ore will be moved from the docks by the time navigation opens next spring. There are, of course, no definite figures as to the amount of ore in the stock piles at the various furnaces but in general it may be said to be quite ample, sufficient at any rate to leave the dock reserve undisturbed until the backbone of winter is broken. Frozen ore is a difficult thing to handle and is avoided whenever possible. It is not expected that there will be any considerable movement of ore from dock to furnace until March.

The shipments to furnaces between May 1 and Dec. 1 of the present year aggregate 16,658,806 tons, compared with 16,903,013 tons in 1903, with 18,423,364 tons in 1902, 14,204,596 tons in 1901 and 11,613,773 tons in 1900. The shipments to

furnaces during the navigation season as referred to are determined in this way: First we have the amount of ore on Lake Erie docks before the opening of navigation, May 1 last, 4,534,103 tons; add to this the receipts of the season just closed, 17,794,598 tons, and the total is 22,328,701 tons; deduct the amount on dock Dec. 1, 5,669,895 tons and we have 16,658,806 tons as the amount that was forwarded, either direct, or from dock to the furnace yards.

It is understood, of course, that the difference between the output of 21,226,591 tons which was shipped from the mines during 1904 and the receipts of 17,794,598 tons at Lake Erie ports, is ore that went to places other than Lake Erie ports, such as the furnaces at Detroit and South Chicago.

The following table shows receipts at Lake Erie and amounts on dock during five years past:

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

Ports.	1904.	1903.	1902.	1901.	1900.
Toledo.....	508,793	652,305	1,037,571	798,238	645,147
Sandusky.....	48,356	130,532	165,556	33,017	154,542
Huron.....	231,364	436,106	520,646	431,311	321,914
Lorain.....	972,931	990,490	1,442,417	721,962	1,090,235
Cleveland.....	3,434,012	4,434,160	4,873,318	3,831,060	3,376,844
Fairport.....	1,157,858	1,434,342	1,538,744	1,181,776	1,085,554
Ashtabula.....	3,639,250	4,242,160	4,796,805	3,931,170	3,709,486
Conneaut.....	4,083,655	3,908,937	4,900,301	3,181,019	2,556,831
Erie.....	1,284,778	1,257,798	1,717,268	1,379,977	1,240,715
Buffalo.....					
Tonawanda.....	1,665,917	2,149,901	2,256,788	1,475,386	1,616,919
Total.....	17,794,598	19,681,731	22,649,424	17,014,076	15,707,787

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

Ports.	1904.	1903.	1902.	1901.	1900.
Toledo.....	318,573	106,710	310,023	254,196	242,375
Sandusky.....	75,134	95,275	95,175	47,384	95,111
Huron.....	182,495	253,249	232,764	231,501	211,977
Lorain.....	299,504	288,581	323,304	195,863	251,838
Cleveland.....	1,143,529	1,337,750	1,500,604	1,378,060	1,337,445
Fairport.....	660,420	845,946	924,236	710,590	611,717
Ashtabula.....	1,403,575	1,911,911	1,967,136	1,769,145	1,811,459
Conneaut.....	684,487	591,364	673,679	604,106	630,514
Erie.....	583,439	657,409	722,966	470,718	480,734
Buffalo.....	318,739	282,890	319,367	198,100	232,100
Total.....	5,669,895	6,371,085	7,074,254	5,859,663	5,904,670

CANADIAN SHIPPING NOTES

The Hamilton Steamboat Co. carried over 43,000 passengers on its steamers during the season of 1904. This is larger by several thousands than has been carried in any previous season.

The Schooner Invictus Co. has been incorporated under the dominion companies' act to carry on a general navigation business. The capital is \$18,752 in sixty-four shares. N. V. Munro, R. W. Elliott, L. S. Shaffner of Brighton, N. S., and R. Lee of Weston, N. S., are the provisional directors.

The Niagara-Welland Power Co. proposes to utilize its canal from the Niagara river to its proposed power development station for navigation purposes, and will apply to the dominion parliament next session for the necessary power.

The Adams Burns Co., Ltd., has been incorporated under the New Brunswick companies' act, with a capital of \$175,000 and offices at Bathurst, N. B., to take over the business of Adams Burns & Co., and in connection therewith to carry on a general towing and ship building business. S. Adams, J. Flanagan of New York city; T. D. Adams, P. J. Burns of Bathurst, N. B., are the provisional directors.

The steamer Glen Island of the Starin Line burned in Long Island Sound last week and was totally destroyed. The fire was believed to have started in the dynamo room located near the center of the vessel. Nine lives were lost. The fact that more were not lost was due to the excellent discipline maintained by the crew.



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DEC. 29, 1904.

The atmosphere of Washington is full of the promise of an early realization of the long promised and much discussed revival of American shipping in the foreign trade. It is one of the things that it is now conceded must be done. It is one of the things that is promised at the present session. It is of the greatest importance, therefore, that the method by which it is accomplished shall be one that shall be effective and stable. Hence it is that the report of the Merchant Marine Commission, which will be filed with congress in another week, and the bill that will accompany the report, are looked forward to with the greatest interest and anxiety, not alone by the advocates of American shipping, but by the foreign shipping interests as well.

Foreign shipping interests have their able and vigilant agents on the spot, where they long have been, whose purpose it will be to render as ineffective as possible any measure that may be proposed for the upbuilding of our ocean-going shipping. These agents will have the quiet, but none the less effective, assistance of the diplomatic agents of foreign governments whose merchant shipping will most likely suffer most from the adoption of an effective American maritime policy. That there will be an outcropping of the arguments of these interests upon the floors of the house and senate is to be expected. These foreign shipping interests, and their allies in and out of congress, have

for more than a generation been strongly entrenched in our foreign carrying, in which they have earned sums ranging between \$150,000,000 and \$200,000,000 annually, with prospects of steady increases, due to the expansion of our foreign trade. With these rich earnings to draw upon, with the active assistance of their several governments assured, American vessel interests keenly realize that the battle ahead will be a most desperate and trying one, one with which they are utterly impotent to deal with like weapons, and that their trust must be upon the determination of the American people to at least do for American shipping what has been done for every other American interest that is subject to the competition of foreign productions.

Congress realizes—at least the leaders do—that the American shipping question is one that will constantly confront them until it has been finally and effectively disposed of. There are those who now say, as there are those who have for forty-odd years been saying, that the present session is not the one at which to press upon the consideration of congress a measure of such magnitude as that of building up our sea-going shipping, and who point out that at the next session, or at some other session, conditions will be much more favorable for success than at the present time. Such sophistry as this, however, is quite wasted upon the advocates of American shipping, and the leaders in congress realize that postponement is no longer justifiable and that those who advocate it, for any reason whatever, immediately arouse suspicion as to their sincerity.

This we know, that at the last session of congress the president recommended and congress provided for the appointment of a commission to make a thorough study of the question in all parts of the United States, that the commission has thoroughly performed its work, that it has accumulated data and suggestion all of which has been published in three huge volumes, that it is about to present its recommendations and a complete bill with which to carry them into effect, and that there is nothing whatever to justify further postponement of enactment. The whole influence of the administration, of the dominant party in congress and a large sprinkling of the minority party, may be depended upon to back up the report of the commission, to support and advocate its bill, and to put it through at the present session.

The details of the bill to be presented have been published, and are therefore public property. Briefly they may be summarized as follows: 1. The creation of a national naval reserve, composed of masters, officers, engineers and seamen, who shall be enrolled in the navy, who shall receive periodically a certain amount of training in naval vessels, who shall be paid an annual retainer and for their services while in training, and who shall be subject to the call of the government in time of war. 2. That vessels carrying a certain increasing proportion of these naval volunteers

shall have remitted to them 80 per cent of the tonnage tax annually paid by them to the government. 3. That the tonnage taxes shall be increased on all vessels, foreign and American alike, from the present rate of 6 to 16 cents per net registered tonnage, on every entry into the United States not to exceed, in the proposed measure, ten trips in any one year, in place of a limitation of five trips in any one year under present law; and in the place of the rate of 3 cents a net registered ton for every entry into the United States, not to exceed five entries in any one year, as at present, within a radius of not to exceed 2,000 miles from the United States, the rate shall be 8 cents per ton, not to exceed ten trips in any one year. 4. That all American vessels, steam and sail alike, engaging in the foreign trade for twelve months in each year shall receive \$5 per gross registered ton, with a proportionate reduction for service in the foreign trade of less than twelve months, no compensation being given to vessels engaging in the foreign trade for less than six months in any one year. 5. That there shall be established mail carrying steamship lines in addition to those now established, as follows: a. A line from Atlantic ports of the United States, to Brazil. b. A line from Atlantic ports to Paraguay and Argentine. c. A line from Atlantic ports to South Africa. d. A line from Gulf ports to Cuba. e. A line from Gulf ports to Mexico and Central America. f. A line from Gulf ports to Colon. g. A line from Gulf ports to Brazil. h. A line from San Francisco to the Orient, via the Hawaiian Islands. i. A line from Puget Sound to the Orient. j. A line from Pacific coast ports to Panama. k. A line from Pacific coast ports to Chili and Peru.

It has been shown from official records that at present the United States annually saves \$2,500,000 from its receipts for sea postage, which receipts will more than supply the funds needed with which to establish the American steamship lines as stated. Great-Britain, it is worth noting at this point, annually expends about \$2,500,000 more than she receives from sea postage. The increased tonnage taxes will more than supply the money needed for the payments to cargo ships, of \$5 per ton, so that the plan proposed by the commission's bill will not subject the government to the expenditure of a dollar of the people's money. That is to say, there will be paid into the national treasury from tonnage tax receipts and sea postage sums larger than will be called for with which to make the payments to American vessels proposed in the bill.

It should also be borne in mind that the tonnage taxes proposed, while a considerable increase over present taxes, are but slightly greater than are imposed in British ports, and substantially less than are imposed in French ports, and that these taxes, as now proposed, conform more nearly to the taxes imposed in other countries than has been the case hitherto under our laws. Moreover, it is a British practice, and long has been, to maintain a national naval reserve among

its merchant marine officers and seamen, and of recent years it has been the British practice to remit to British ships carrying certain apprentices and naval reserve men a portion of the tonnage taxes and light dues collected from them.

The measure in question does not in the least degree infringe upon any of our treaties, does not directly discriminate against any foreign vessel or its cargo, and should not provoke any foreign retaliation.

This bill has been prepared by the Republican and Democratic members of the commission, and it is believed will command their united support and advocacy in the senate and house of representatives. The Republicans have long been convinced that, only through government aid, is it possible to build up a great American merchant marine. Democrats at one time were of the opinion that the free importation and American registry of foreign-built ships would solve the problem, a delusion that has been entirely dissipated by the unanimous agreement among American owners of foreign shipping that they would not place their vessels under American registry to engage solely in the foreign trade without some form of government aid or discrimination in their favor. The Democrats have also seriously considered the question of reviving the old American policy of discriminating duties, as have a number of influential Republicans, but when confronted with the mildest possible form of a discriminating duty bill, a bill that only discriminated against foreign vessels bringing cargoes into the United States from ports other than their own, but which necessitated a temporary duty upon non-dutiable imports, although providing for a reduction in the amount of the duty on dutiable imports, the entire commission unanimously rejected the bill and abandoned the policy. With the Democrats themselves convinced of the futility of a free ship measure, and also convinced of the immediate impracticability of discriminating duties in any form, they realize that there is no alternative presented to them than to extend the direct aid of the government to our merchant ships in the foreign trade, on which account it is expected that the Democratic members of the commission will favor the bill which they have assisted in framing, or, by their opposition and the defeat of the measure proposed, perpetuate the present foreign control of our foreign carrying, leaving the United States without a merchant marine such as competing foreign nations are annually spending millions of dollars upon for their naval utility and for the extension of their foreign commerce.

The Detroit harbor of the Masters & Pilots' association has decided by unanimous vote to go out of existence and to surrender its charter. Last spring the Detroit harbor had 365 members. Advices from lake ports are to the effect that other harbors of the Masters' & Pilots' association have decided to surrender their charters also. There is some talk about the mates organizing but it does not appear that the masters will again desire to belong to an association with their subordinates.

FULL REPORT FROM SAULT CANAL

The total traffic through the Sault Ste. Marie canal for the season of 1904 was 31,546,106 tons as against 34,674,437 tons for 1903, 35,901,146 tons for 1902, which was the highest on record, and 28,403,065 tons for 1901. The commerce of 1904, therefore, shows a decrease of 3,128,331 tons as compared with 1903 and 4,415,040 tons as compared with 1902. It shows, however, an increase of 3,103,041 tons as compared with 1901 which, distributed over the three years that have elapsed since 1901, would mean an increase of 1,000,000 tons per annum. Considering the brevity of the lake season 1904 has done very well indeed. Following is the full summary of the traffic of both canals, Canadian and American, for the three years past:

COMPARATIVE STATEMENT OF LAKE COMMERCE THROUGH CANALS AT SAULT STE. MARIE, MICHIGAN AND ONTARIO, FOR THE SEASONS OF 1902, 1903 AND 1904.

	1902.	Seasons. 1903	1904.
Steamers Number	17,630	14,027	12,188
Sailing Number	4,308	3,509	2,994
Unregistered Number	1,222	1,030	938
Passages Number	22,059	18,506	16,120
Lockages Number	12,846	11,042	10,315
Tonnage:			
Registered Net	31,955,582	27,736,444	24,394,138
Freight Net tons	35,901,146	34,674,437	31,546,106
Passengers Number	59,377	55,175	37,695
Coal:			
Hard Net tons	300,948	1,130,095	991,228
Soft Net tons	4,502,530	5,788,628	5,463,041
Flour Barrels	8,910,240	7,093,389	4,710,538
Wheat Bushels	70,730,995	61,384,552	49,928,809
Grain (other than wheat) Bushels	27,740,822	32,995,646	33,033,902
Mfg. and Pig Iron. Net tons	198,152	193,297	229,085
Salt Barrels	443,306	454,882	395,459
Copper Net tons	120,612	112,877	100,695
Iron Ore..... Net tons	24,277,555	21,654,898	19,035,797
Lumber M ft. B. M.	1,091,471	1,023,192	923,289
Silver Ore..... Net tons	1,356
Building stone. Net tons	38,919	21,399	27,093
Gen. merchandise. Net tons	740,100	659,839	732,000

The United States canal was opened May 5 and closed Dec. 13, 1904; season, 223 days.

The Canadian canal was opened April 30 and closed Dec. 25; season, 240 days.

FAILURE OF WILLIAM PETERSON, LTD.

William Peterson, Ltd., of Newcastle-on-Tyne, England, have failed, one cause of the bankruptcy being said to be the endeavors of the company to establish a line of steamers between Montreal and continental ports. The firm first came into prominence in connection with the turret type of steamers, and of these a number were chartered to the Dominion Coal Co. to carry coal from Sydney, N. S., to Montreal. In 1897 a contract was entered into with the dominion government for the establishment of a fast line of steamers between Canadian and British ports, it being proposed to utilize steamers of the turret type. The company made a deposit with the government which was forfeited on its failure to establish the service within the time stipulated. In 1902 the Canadian Lakes & Ocean Navigation Co., Ltd., was established with W. Peterson as vice president to establish a line of steamers on the great lakes and the St. Lawrence river, the nucleus of the fleet being the Turret Cape, Turret Court and Turret Crown. Three steamers, the J. H. Plummer, A. S. Ames and H. M. Pellott, were subsequently added and at the end of the year Mr. Peterson retired from this official position and returned to England. The Canadian Lines, Ltd., was established in 1903 to establish a line of steamers between Canadian and European ports, and in connection with it steamers were run from Antwerp to Montreal, carrying passengers and freight,

and early in 1904 an effort was made to earn a subsidy voted in 1903 by the dominion parliament with a view of establishing a line of steamers between Montreal and a French port. The subsidy was first taken hold of by a Bordeaux firm but as it also carried freight and passengers to St. Pierre, Miquellon, the French port off the Newfoundland coast, the contract was cancelled. During 1904 one of the Antwerp steamers was fined \$25,000 for allowing a number of Syrians, ordered deported, to escape. The failure of William Peterson, Ltd., does not affect the Canadian Lakes & Ocean Navigation Co.

DATES OF CLOSING OF SAULT STE. MARIE

The American locks at Sault Ste. Marie canal closed on Dec. 13, having opened on May 5. A season of 223 days. The Canadian canal was opened on April 30 and closed on Christmas day, having remained opened for the arrival of two tugs from Michipicoten, a season of 240 days. Following are the opening and closing dates of the American locks since 1855:

Date.	Open.	Close	Date.	Open.	Close.
1855.....	June 18	Nov. 23	1880.....	Apr. 28	Nov. 15
1856.....	May 4	Nov. 28	1881.....	May 7	Dec. 5
1857.....	May 9	Nov. 30	1882.....	Apr. 21	Dec. 3
1858.....	Apr. 18	Nov. 20	1883.....	May 2	Dec. 11
1859.....	May 3	Nov. 28	1884.....	Apr. 23	Dec. 10
1860.....	May 11	Nov. 26	1885.....	May 6	Dec. 2
1861.....	May 3	Nov. 14	1886.....	Apr. 25	Dec. 4
1862.....	Apr. 27	Nov. 27	1887.....	May 1	Dec. 2
1863.....	Apr. 28	Nov. 24	1888.....	May 7	Dec. 4
1864.....	May 2	Dec. 4	1889.....	Apr. 15	Dec. 1
1865.....	May 1	Dec. 3	1890.....	Apr. 20	Dec. 3
1866.....	May 5	Dec. 3	1891.....	Apr. 27	Dec. 7
1867.....	May 4	Dec. 3	1892.....	Apr. 18	Dec. 6
1868.....	May 2	Dec. 3	1893.....	May 1	Dec. 5
1869.....	May 4	Nov. 29	1894.....	Apr. 17	Dec. 6
1870.....	Apr. 29	Dec. 1	1895.....	Apr. 25	Dec. 11
1871.....	May 8	Nov. 29	1896.....	Apr. 21	Dec. 8
1872.....	May 11	Nov. 26	1897.....	Apr. 21	Dec. 14
1873.....	May 5	Nov. 18	1898.....	Apr. 11	Dec. 14
1874.....	May 12	Dec. 2	1899.....	Apr. 26	Dec. 20
1875.....	May 12	Dec. 2	1900.....	Apr. 19	Dec. 16
1876.....	May 8	Nov. 26	1901.....	Apr. 20	Dec. 21
1877.....	May 2	Nov. 30	1902.....	Apr. 1	Dec. 20
1878.....	Apr. 8	Dec. 3	1903.....	Apr. 9	Dec. 15
1879.....	May 2	Dec. 3	1904.....	May 5	Dec. 13

NEW WHARVES LEASED TO PACIFIC MAIL

A fifteen-year lease of the two new wharves to be built on the site of the present mail dock has been awarded to the Pacific Mail Steamship Co. The harbor commissioners of California have received the money for the construction of the wharves and in a year the Pacific Mail Steamship Co. will have wharves adequate to the growing trade with the Orient. The contract for building was awarded to Healy, Tibbitts & Co., the price for the two wharves (one of which will have two docks) being \$320,673. The Holmes Lime Co. has received a contract for \$42,000 for cement.

The bid for the fifteen-year lease was \$371,673, the company to collect and retain for its own use dockage and tolls to an amount not exceeding \$625 per month. The work will take eight or nine months and the lease dates from the completion of the wharves and their acceptance by the harbor commissioners. The new wharves will be the first modern ones in San Francisco harbor, and their construction is the first step towards the improvement of shipping accommodations there.

The Bassett bill providing for fireproofing the superstructure of steamboats and for making benches and chairs and other portable equipment on board vessels, life preservers in nature, is attracting considerable attention. The house committee on interstate and foreign commerce will allow ample time for the discussion of this measure by interests effected by it.

REPORT ON THE NICLAUSSE BOILER

The report of the board of naval officers which tested the improved Niclausse boiler, has been made public by the chief of the bureau of steam engineers. The board consisted of Capt. J. A. B. Smith, senior member, Comdr. W. B. Bayley, and Lieut. Comdr. W. M. Parks. The test was made at the works of the Stirling Boiler Co. and included careful experiments to determine the efficiency of the boiler at different rates of combustion. The improved type is exactly like the boilers built for the battleships Virginia and Georgia and the armored cruisers Pennsylvania and Colorado, except that the experimental boiler is twelve headers wide, while the boilers for the ships named are each thirteen headers to sixteen headers wide. Moreover, the boilers for the Georgia have a small steam dome on the steam drum and have 6 in. greater depth of furnace space. The casing of the boiler tested is exactly the same as used on the boilers of the vessels named. The test was generally satisfactory and the board, in its reports, says that after the last test the boiler was carefully examined and found to be in good condition. The report continues: "The brick work and the casing generally was found to be absolutely straight and not burned in the least. All the tubes of the three bottom rows and all the tubes of three middle headers, or ninety-nine in all, were taken out in the presence of the board by two machinists and four helpers in 1 h. 18 m. The tubes were tested with a straight edge and all were perfectly straight except two very slightly bent. With all the tubes out of the three middle headers, the inspection of the other tubes on both sides of the vacant space was easily made by going from the furnace up to the base of smoke pipe and then out through a manhole in the breeching. Inspection of the tubes remaining in the boiler, as well as inspection of all baffling, was made in the above-mentioned manner." Regarding the reports made concerning the great volume and density of smoke from the Niclausse boilers of the Maine the board, in its reports, says it particularly observed the quantity and quality of the smoke as it came from the top of the smoke-pipe of the experimental boiler during these tests. It was found that the quality and quantity of the smoke could be regulated, in a great measure, by the firing. A thick fire with infrequent firing, as is usually the custom in firing Scotch boilers, produced less perfect combustion with consequent volume of thick smoke. The method of firing, the experimental boiler was that of frequent and light firing, carrying fires about 6 in. thick and as even as possible. The furnace door was kept open as short a time as possible. The board expresses the belief that with this method of firing the smoke from the experimental boiler was not in excess of that from any other water-tube boiler fired under the same conditions of coal and rate of combustion. It is pointed out that skill and expertness of the fireman are absolutely necessary with water-tube boilers to keep the smoke within ordinary limits. Firemen for water-tube boilers must be properly trained for the work and their work in the fire-room must be closely and skilfully superintended.

DECLINE OF FRENCH MERCHANT MARINE

Robert P. Skinner, consul general at Marseille, France, says in a paper to the state department that the French merchant marine continues to suffer acutely from an apparently insuperable difficulty—lack of outgoing freight. In Marseille, for example, decidedly the most important French port, against 4,666,198 tons of goods imported during 1903 but 2,170,212 tons were exported. Added to this vital complaint of ship owners is the increased cost of operating French ships compared with those of other nations, and, by no means least of all, troubles with labor. During three months of 1904 the Marseille fleet lay idle in the port while labor troubles were being settled,

and during this long period foreign ships were regularly transacting their accustomed business.

The following table exhibits the general statistics of French shipping, excluding the coasting trade:

ENTRANCES AND CLEARANCES AT FRENCH PORTS IN 1902 AND 1903.

	French ships.		Foreign ships.	
	All France	Marseille	All France	Marseille
Entered:				
Number ships, 1902	7,581	5,807	17,326	2,508
Number ships, 1903	7,559	5,909	17,031	2,763
Tonnage 1902	4,745,300	3,250,209	13,622,562	3,301,518
Tonnage 1903	4,814,849	3,405,893	14,449,875	3,795,434
Cleared:				
Number ships, 1902	7,565	5,824	13,459	2,517
Number ships, 1903	7,559	5,927	13,887	2,753
Tonnage 1902	4,538,542	3,232,540	9,195,921	3,307,472
Tonnage 1903	4,603,494	3,473,240	9,716,619	3,778,173

The statistics of the port of Marseille continue to demonstrate the increasing sea power of the smaller maritime nations operating cheaper ships with cheaper men than either Great Britain or France. While the amount of merchandise landed and shipped from Marseille from 1900 to 1903, inclusive, increased by 936,335 tons, French ships benefited by only 163,252 tons of increase and British ships by only 89,726 tons. During the same interval the freight going out and coming in on ships of other foreign nations increased by 683,357 tons. Three Mediterranean nations show increases in the last three years greater or almost as great as those of Great Britain or France, namely: Italy, 183,000 tons; Greece, 190,208 tons, and Spain, 142,318 tons. The increasingly profitable business of these smaller maritime nations per ton of shipping employed is even more striking, as this table shows:

TONNAGE OF SHIPS OF THE LEADING NATIONS ENTERING AND LEAVING MARSEILLE, AND FREIGHT CARRIED BY THEM.

Country.	Freight landed or embarked.	Tonnage of ships.
France	3,274,444	6,939,133
Great Britain	1,190,274	3,700,455
Italy	584,866	883,644
Greece	494,095	476,006
Spain	377,753	666,325

NEW WORK ON NAVAL ARCHITECTURE

"The Naval Constructor" is the title of a new work prepared by George Simpson, a member of the Institute of Naval Architects, for students in ship design, naval architects, ship builders and owners, marine superintendents, engineers and draftsmen. This handbook has been prepared with the object of supplying a ready reference for those engaged in the design, construction and maintenance of ships—such a work as should give simply and concisely the information on most of the points usually dealt with in the theory and practice of marine architecture and in addition much that is original. Under the latter heading should be included the chapter on design and many of the tables of standardized fitting details. It has been the author's aim to eliminate all obsolete matter and antiquated data and to bring the book right in line with present day requirements. The volume is very compact, is excellently printed and bound and is for sale by the Marine Review at \$5 per copy.

The gunnery record trophy presented by President Roosevelt to the battleship Oregon was unveiled at Manila last week. Rear Admiral Yates Stirling, in command of the battleship squadron of the Asiatic fleet, made the presentation speech. The trophy is a large bronze plate, 18 by 21 in., representing in the foreground a battleship at target practice and also a battleship in the background similarly engaged. The battleship Oregon has the distinction of being the first vessel of her class to win it at the opening competition last spring.

CARRYING COAL TO MANILA

The Bureau of Equipment Reserves it to American Ships—Distinct Victory for American Ship Owners

The greatest satisfaction is being expressed by American vessel owners in all parts of the country over the determination of the navy department to employ only American vessels for the shipment of coal to Manila. When the government advertised, through the bureau of equipment of the navy department, for bids from American vessels for the carriage of coal to Manila, the bids to be opened on Nov. 15, the rate proposed by American sail vessels was \$6.50 and by American steam vessels from \$7 to \$7.50 per ton. Unasked foreign ship owners also presented bids, ranging from \$4.19 to \$5.50, and, with the rejection of all the bids and the readvertising by the bureau of equipment for new bids from American and foreign vessels, it was the confident prediction of foreign vessel owners and the extreme fear of American vessel owners that the foreign vessels would secure the carrying. While but 25,000 tons are to be carried at once, 100,000 tons will be carried forward as rapidly as tonnage can be secured. It was alleged by the officials of the navy department that it would cost \$58,000 more to carry the 25,000 tons and \$210,000 more to carry the 100,000 tons in American than in foreign vessels. At this critical moment certain powerful and most influential American statesmen took the matter up in a most earnest and determined manner with both the president and the secretary of the navy, also with the bureau of equipment. It was pointed out that the act passed at the last session of congress required the carriage of this coal in American vessels if the charges were not unreasonable. It was made perfectly clear that the charges made by American vessel owners for the carriage of the coal were quite reasonable, and when this fact was made clear the bureau of equipment, as soon as the bids were opened anew on Dec. 15, promptly engaged all of the American tonnage available that had placed the lowest bids. It is understood that new advertisements will at once be published, calling for additional American tonnage, as the supply of coal at Manila is no more than will last until the first new supply under the recent bids reaches that place. There is a plenty of American tonnage, sail and steam, available for the carriage of this coal, if its owners will bid for it. Should these American owners of available tonnage fail to offer their vessels, then it may be necessary to employ foreign tonnage, after all, a result that would be most unfortunate, if not disastrous, to American vessel interests.

It appears that the navy department has permitted its supply of coal at Manila to fall far below the minimum quantity supposedly kept on hand at all times. The reason for this delay in shipping coal to Manila to keep up the supply has not been explained by the government, although the owners and brokers for foreign vessels profess to be well advised as to the reasons, reasons that would have inured to their sole advantage, they now say in their deep chagrin at the rejection of their bids, but for the totally unlooked for interference of influences powerful enough to secure for American vessels what the president has been quoted as calling "a square deal." With this influence successfully exerted in their behalf it would be the most egregious folly for American vessel owners not to take every possible advantage of the condition thus created, and place at the command of the bureau of equipment, navy department, an abundance of tonnage for the carriage of the 100,000 tons of coal now needed, and the hundreds of thousands of coal that will be hereafter needed at Manila.

The bureau of equipment of the navy department now says that the bids recently made and accepted by the bureau from American vessel owners, of \$6.50 for sail and \$7 for steam vessels, are reasonable. No one who knows the facts doubts that there is more than enough American tonnage, which can

earn a fair return upon the investment, for the carriage of this coal. Its owners will do themselves an immediate and serious injury and American vessels in general what will probably be a great and permanent injury, if they fail to provide the navy department with all of the tonnage, and at once, that may be needed to carry the coal required at Manila.

MIDVALE ARMOR PLATE TESTED

Bids will be opened by the navy department on Jan. 12 for 8,000 tons of armor plate required by the battleship New Hampshire and the armored cruisers Montana and North Carolina. For ten years past only two concerns have supplied this plate to the navy—the Carnegie Steel Co. and the Bethlehem Steel Co. However, last year the Midvale Steel Co. of Philadelphia secured a contract for furnishing 6,180 tons of armor by submitting a very low bid. Opposition to the acceptance of these bids was quite strenuous at the time on the ground that the Midvale company could not deliver the armor plate on time, having at that time no plant in which to make it. Last week, however, two plates manufactured by the Midvale company were tested at the Indian Head proving grounds at the request of the company. They were not plates intended for delivery but were tested simply to demonstrate the quality of the armor. They met all requirements and would have been accepted had they been plates intended for service. It is not known what process the Midvale company employs. It is known, however, that it pays no royalty either to Krupp or Harvey.

PERSONAL

The recent appointment of A. P. Fenerty to the position of master boilermaker at the League Island navy yard will cause much satisfaction to naval engineers and also to many in the merchant service, among whom he is well known. Mr. Fenerty is one of the most competent boilermakers in the country and is as well known on the lakes as on the Atlantic seaboard, having been for some years superintendent of Wickes Bros.' plant at East Saginaw, Mich. He will have control of all repairs to boilers and the naval vessels will be faithfully looked after during their stay at League Island.

OBITUARY

Elmer Chambers of Buffalo who died suddenly at Buffalo this week was a member of the Marine Engineers' Beneficial association though he had not sailed for the past fifteen years.

Henry C. Fisher, an old time lake engineer, died this week at Detroit. He was seventy-three years old and had sailed until about five years ago.

Judge Thomas in the United States circuit court of New York this week handed down an exhaustive opinion, overruling the demurrers interposed by the defense in the Slocum case. This opinion renders good the indictments against Frank Barnaby, president of the Knickerbocker company; Secretary Atkinson, Treasurer Dexter, Commodore Pease and Capt. Van Schaick, who commanded the ill-fated steamboat. The indictments against Inspectors Lundberg and Fleming were sustained in a previous opinion of Judge Thomas.

The fleet of nine steamers which the Belgian government maintains for the cross-channel service is to be increased by the addition of a turbine steamer with a speed of 23 knots. It is said that Belgium intends to replace gradually all the old steamers of a speed of 10 knots by turbine steamers similar to that to be introduced shortly. The new steamer is to be fitted up splendidly. Among other conveniences it will carry a Marconi apparatus for the use of voyagers, and also a powerful searchlight on the bridge.

SIMPLE METHODS IN WARSHIP DESIGN

One of the most discussed papers at the recent meeting of the Society of Naval Architect & Marine Engineers at New York, was Mr. George W. Dickie's paper upon the subject "Simple Methods in Warship Design a Necessity." Mr. Dickie's paper was very valuable and was as follows:

"At the society's meeting of 1899 I presented this subject in order to relieve my mind somewhat in regard to it. In the discussion of that paper there appeared to be a unanimous opinion that warship fittings were getting to be too complicated. The present chief constructor of the navy then expressed himself in regard to the lines I had advanced, that they were decidedly the correct ones, and expressed the hope that after that meeting I would find ample opportunity to still further amplify my ideas. This was a prophetic utterance on the part of Admiral Capps. The opportunities during the five years that have elapsed since that statement was made have not only been ample but have been so overwhelming as to practically engulf the hapless ship builder who has tried to withstand the tide of increasing complication in the modern warship.

"The modern warships, and I think also the men who design and build them, may be classed as complicated combinations of compromises that have come to be so involved in structure and function as to be quite incomprehensible even to the experts themselves, whose desire to leave nothing out that could possibly be brought into the design, obliges them ever after to be inventing reasons why such devices ever found a place in the design of a warship.

"The reasons I gave in 1899 for the complicated conditions on war vessels apply with equal if not greater force now. These are:

"First—Uncontrolled growth of new devices for doing the many things for which mechanism is required on these vessels, without the new devices being considered reliable enough to supersede the old. Hence duplication, and, in many cases, triplication of apparatus for doing one thing for which one good device alone should be used.

"Second—The system of divided control over the work renders it impossible to have a homogeneous design to begin with that would enable the ship and all that is required of her to be treated as one machine, and provision made at the start for every function being considered with relation to every other function.

"Since 1899 additional causes of complication have been brought into play. Special experts in certain lines of work have been given charge of the work in which they are expert, thus bringing about a struggle for room to place all the devices the experts think to be necessary to make their specialties complete. To make this possible, specifications have been prepared and cleverly worded to cover the unknown requirements of the future, which, when finally worked out, produced two results—a tangled mass of complications on the ship and a financial complication to the contractor. This further increase of complication has developed so rapidly during the past three years that ship builders have suffered very great loss in consequence. Ships now building, or in the last stages of completion, and which were supposed to be duplicates of those already built, the specifications and original plans having been identical, have been made much more expensive, more complicated, and, I fear, less efficient, by this process, most of which has been brought about at the ship builder's expense, through elastic specifications and non-elastic boards on changes.

"The item of ventilation on ships now building and re-

cently completed has cost on an average about three times what it cost on similar vessels completed three or four years ago, the specifications being worded the same. This one feature in the increasing complication has involved the ship builders in a loss on all the ships building when the change was effected of somewhere near one million dollars without any corresponding benefit resulting to the vessels thus hampered with a network of air ducts and electric fans. The condition on these ships has now reached such a stage of complication that a large number of experts is found necessary to get the thousands of intricate devices tuned up for inspection so that everything will function as specified, and to keep them in that condition, is, I am afraid, a task beyond the ability of the officers and men in charge of this modern puzzle, and this notwithstanding the great ability of these officers and those under them. It is the duty of the naval architect and marine engineer to set about unraveling the tangled mass of intricate contrivances on board our modern warships, doing away with all that is unnecessary, and arranging what is absolutely necessary in such order that it can all be understood by the men who have to work it and keep it in order, and so that anything needing repair can be gotten at without destroying everything surrounding it to do so.

"I am taking this matter up again, not because I like the subject, for to me it is a painful one, but because no one else appears to care to do so. It has given me much work and considerable personal expense to get my ideas into anything like presentable form. I have also been urged to it by many naval officers in every position of responsibility on our warships. These men feel the increasing complication and multiplying diversity of function sought to be reached by mechanical contrivance have become a positive dread to the officer who is held responsible for it all operating in the proper way, and at the proper time, just as its designer said it would do if kept in proper order.

"I am also under the impression that my active participation in the building of warships is drawing to a close, and am, therefore, desirous of presenting this subject, which has occupied much of my thought for the past twelve years, as my final contribution on the subject. Some of the things I am to propose in this paper were first suggested by me in a paper read before the international engineering congress, held in connection with the World's Columbian exposition at Chicago in 1893. Since that time the question of simpler arrangements on these ships has been almost a constant study with me, and although all my efforts have resulted in nothing except protesting against a steady movement in the opposite direction, I am still confident that a change must come, resulting in simple methods and consequently greater efficiency in naval vessels.

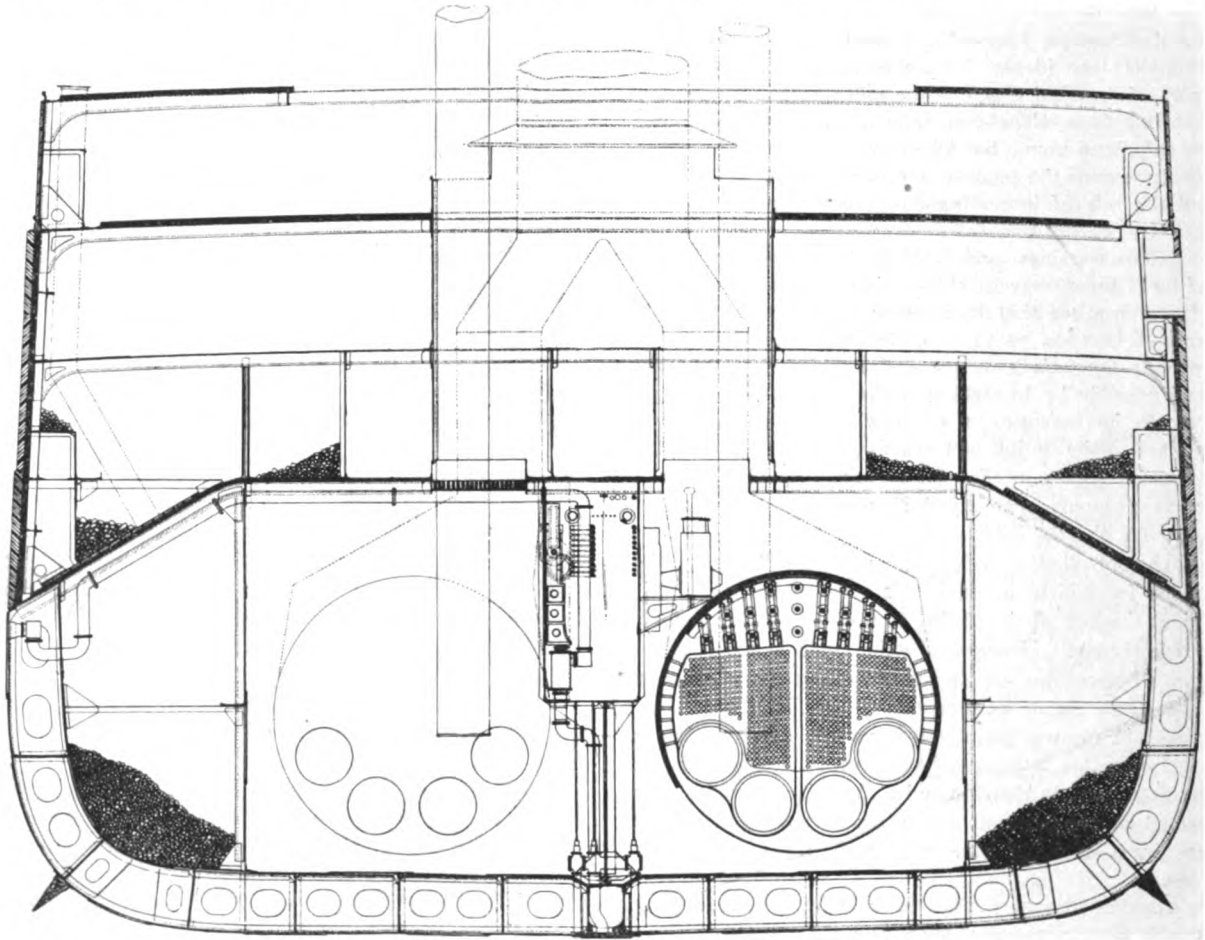
"The plans I have prepared to illustrate this paper are intended only to show the application of the methods proposed to secure the result aimed at, and are in no sense to be considered as proposed designs for the type of vessel they represent. The methods proposed are shown as applied to a modern armored cruiser, because that type of vessel happens to be the one I am at present struggling with. I have not been able to work out in full detail all the ideas I expect to present in this paper, although many of them have been worked out by sketches sufficiently in detail to determine their practicability. It would have pleased me much to have worked out every detail and presented a complete set of working plans for such a vessel as I have had in mind in the prepar-

ation of this paper, but as I could only afford to employ one draughtsman on this work it is necessarily incomplete. I trust, however, that with the plans I have been able to present, showing the main features of the methods I propose, I may be able to place before this society the conclusions I have reached in regard to how the inevitable complication on board a modern warship might be materially simplified, rendered more easy of access, and more readily understood by the man of average intelligence in whose care these complicated fittings are usually placed.

"Since first proposing to incorporate into the structural features of the ship a central passage, through which would be carried on all the business of managing and controlling the many important operations that are continually being carried out on a war vessel, I have been continually adding to

ship through adjustable louvres on all four sides, thus enabling the weather side to be closed when necessary. Six independent electric fans are fitted at the base of the air duct, each having a capacity of 15,000 ft. of free air per minute, and so arranged with their own independent connections to the main air duct as to admit of any fan being shut off, if its capacity is not required to keep the air pressure up in the main passage, where we will leave it until we consider the ventilation of the ship.

"The passage runs parallel to the keel from frame 40 to frame 95, and has in this portion a general width of 4 ft., except in the drainage pump stations on the port side, located at about the following points: frames 38-42, 55-58, 72-75 and 90-93. The roof of the passage in this section is the protective deck, and the floor, which is 12 ft. 6 in. below the pro-



GENERAL SECTION SHOWING CENTRAL PASSAGE.

the varied functions of such a feature in the design. In the outline plans illustrating this paper, the central passage begins at frame No. 11, forward, and in cross section extends vertically from the lower platform deck to the protective deck, its width being 3 ft. in the clear. Between frames 11 and 12, a vertical trunk, 3 ft. by 2 ft. 6 in., having an air lock entrance on the gun deck, affords means of access to the central passage. At frame 20, the floor of the passage drops vertically 9 ft. and runs under the submerged torpedo room to frame 28½, where it again rises to the level of the lower platform deck and passes under the handling room of the 8-in. turret, continuing on this level to frame 35, where it rises 2 ft. Between frames 33 and 35 the passage widens to 12 ft., forming a central station. From frame 35 to 40 the width is 15 ft., to accommodate the fans and motors, which draw air through a vertical ventilation duct, 12 ft. by 12 ft., which extends between frames 37 and 40 to the upper or boat deck, where it receives air for the ventilation of the whole

protective deck, forms the horizontal stiffener for the center line bulkhead. At frame 93 the passage drops to the level of the lower platform on which it runs, passing under the 8-in. magazines and handling rooms to frame 108, where it rises to the level of the steering gear flat. Between frames 95 and 111 the width of the passage is 3 ft. At this point it widens into the steering gear room, taking up the full width of the ship. At frame 108 there is an automatic, electrically operated watertight door, which, in case the steering compartment were damaged, would automatically shut it off from the central passage proper. That this passage is the most important feature in the plan I am presenting will appear as its connection with all the work of the ship develops. I have designed it as one watertight compartment, without any subdivision between the bulkhead at the forward end, about 50 ft. from the ram, and the automatic door just forward of the steering gear compartment. This condition appears to be necessary to meet all the requirements of my design. I have given this

much thought and cannot conceive of any damage, short of total destruction of the vessel, that would impair the integrity of this compartment. How a compartment of this character can be so worked into the general design of the ship as to render it possible a simple and easily understood arrangement of what might be termed the nervous system of a warship, is the subject I have set myself the task of bringing before this society, the discussion on which I hope will be of such a character as to bring out both its merits and defects.

"In order to avoid confusion in dealing with the various matters, the aggregate of which has resulted in so much complication, it will be better to deal with each item separately, and in doing so I do not propose to separate construction work from engineering or equipment. Some quite serious complications in warship construction are the result of divided responsibility.

"The first item I propose to consider is that of drainage, and here divided responsibility has stood in the way of the adoption of simple methods that admit of being provided for in the structural design of the ship. In 1893 I proposed, in a paper read before the engineering congress at the Columbian exposition, to provide for all drainage in the structural arrangement of the double bottom. I have given this matter considerable thought during the eleven years since presenting it in that paper, and am more than ever in favor of so constructing the framework between the outer and inner skin as to provide a continuous well that would receive the drainage of the whole ship, except that of the double bottom itself.

"Referring to the general midship section illustrating this paper, I have shown two vertical keel plates instead of one, placed 24 in. apart. The center plate of the inner bottom is dished 6 in., forming a gutter waterway on each side of the middle line bulkhead. This is carried the whole length and covered with a perforated plate forming a continuous strainer of great area. A sufficient number of valves are fitted in the dished plate in each compartment to give a clear area from each main compartment into the main drainage well equal to the total pumping capacity. These valves would be operated from the floor of the central passage. The main drainage well is in itself a watertight compartment, all openings into it being controlled from the central passage. Its size, as shown, is 24 in. by 30 in., being large enough to admit a man for inspection and painting. We have thus provided, as far as horizontal drainage is concerned, a complete system without adding anything to the general structure of the vessel, and it is a real drainage system into which every compartment above the inner bottom naturally drains, requiring only some simple means of lifting the water that drains into the space between the vertical keels, and discharging it overboard.

"Originally this work was performed by hand lift pumps, operated by men working on cranks or pump brakes and drawing the water through a simple vertical suction, but, owing to the power employed, very limited in capacity; there was also considerable waste of the small power available through crude mechanism, and by lifting the water to a deck, usually much higher than the level of the water outside, these hand drainage pumps, as fitted to naval vessels, were usually made to act also as force pumps, to be used in case of fire, thus very much reducing their efficiency as drainage pumps. When steam became the means of propulsion in naval vessels the hand drainage pump was supplemented by a drainage or bilge pump, worked from the engines. This required that water be taken from any part in the length of the ship to the engine room before it could be lifted up and discharged, and this introduced horizontal pipes and manifolds. Then independent steam drainage or bilge pumps came into use and these were placed in the engine rooms, still further adding to the horizontal complication of piping and valves. These pumps are also fitted as fire pumps, making them the worst type of pump that could be devised for drainage purposes. To this

has been added another class of pump called auxiliary feed, fire and bilge pumps, forming another combination worse than the other, the three functions sought to be combined being as far apart as they could possibly be in mechanics. To get the water to all these varied machines in order to be lifted to the level of the water outside the ship involves the designer in a mass of horizontal piping, which, coupled with the manifold system, converts the space between the working floors and the inner bottom into a perfect network of piping that is very hard to get at, and, in consequence, very difficult to keep in order. Recently, I counted fifty-one drainage pipes in the forward of the engine room in a new battleship, and there would have been more if space could have been found for them.

"I would, therefore, propose to abolish the whole present system of horizontal piping, and all manifolds and emergency connections to circulating pumps, with all their numerous connections and valves. I would have no such unnatural combination as a bilge and fire pump or a feed and bilge pump—the two functions as entirely opposed to each other. A good bilge or drainage pump is of no use as a fire or feed pump, and a good fire or feed pump is the worst possible form of pump for drainage purposes, for the reason that a drainage pump should be able to take either wind or water or any combination of the two, and that is what the type of steam pump called a fire and bilge pump will not do.

"I have thought much about the best type of drainage pump, and have finally come to a settled conviction that the type of pump proposed in the paper read by me before this society in 1899 best meets all the conditions of the special service involved in a simple drainage plan suitable for a naval vessel. This is simply a single-acting jackhead lift pump, which will take air. I have, therefore, arranged on the port side of the central passage, as shown on the plan, four pumping stations, formed by widening the passage at the points indicated enough to avoid obstructing the passage by the pumps and their operating gear. In each pumping station would be installed a set of three simple jackhead lift pumps, having 12-in. diameter buckets and 20 in. stroke, operated by a 12-H. P. electric motor. At full speed the pumps would make forty strokes per minute. The total lifting capacity of the four pumping sets would be 1,100 tons of water per hour, or 4,800 gallons per minute. The arrangement of suction and discharge pipes is clearly shown on the midship section, and consists of a simple vertical suction pipe from each pumping station extending down into the drainage well, controlled by a valve above the inner bottom. From the valve chamber on each side extend branches with the valves for pumping out the double bottom compartments. The stems of the main and side valves are extended up through the floor of the central passage, where they would be operated as required by the man in charge of drainage. The discharge pipe extends directly up to the protective deck and over to the side of the ship between two beams, where it discharges through a non-return valve, all as shown on the midship section.

The whole drainage system requires 60 ft. of suction pipe, 160 ft. of discharge pipe, and sixteen valves.

"This replaces on a similar ship fitted under the present system of drainage, 3,738 feet of piping, in 324 pieces, 444 fittings and flanges, 124 valves, 113 bulkhead fittings, and 62 McComb strainers; all of which require the making and keeping tight of 1,225 joints. Besides, there is operating gear for valves all over the vessel, often far from the valves, both in a vertical and horizontal direction. I have not considered the manifolds in this statement of valves, as these are represented in the plan I propose by the drain valves that admit the water from above the double bottom into the main or common drainage well, nor have I counted such pipes as would be necessary to drain flats and small compartments at the ends of the vessel, which would also be needed in my plan. The whole drainage would be managed from the central passage, the

plates for all valves being on the floor, as well as sounding tubes. The dished form of the middle line plate for the inner bottom covered by a strainer plate extending through the whole length of the drainage well, which is practically the whole length of the ship, prevents all dirt, except what will pass freely through the pumps, from getting into the well. The whole drainage, now so complicated, becomes, when handled from the central passage, very simple, and on that account very much more reliable.

THE PROBLEM OF VENTILATION.

"I will now consider the problem of ventilation, and I approach this subject with considerable trepidation, knowing that my views are entirely opposed to the present practice on United States naval vessels. The problems involved in the ventilation of the modern warship are probably the worst that the naval architect has to deal with. The great power to be developed on these vessels and the high temperature of the steam carried means that more than half of the middle length of the ship under the protective deck is full of heated surfaces to something like 300°, making the ventilation problem for the middle part of the ship more that of removing hot air than that of supplying fresh air. Some time ago, I proposed for one of the high-powered new cruisers, fitted with water-tube boilers, to encase each of the boilers with an outside casing, having an air space of about 2 in. between the boiler and this outer casing. In this space on the top of the boiler I proposed to blow the air for combustion, with arrangements to insure that the air current went over the whole surface on its way to the ash pits and to the openings above the grates, the outer casing to be made portable and provided with doors where the boiler casing had doors. All the radiant heat from the boilers would thus be taken up by the air for combustion and added to the furnace temperature instead of, as now, adding greatly to the difficulties of ventilation. This proposition was thought very good by the bureau of steam engineering, but disapproved on account of the added weight. This added weight for the twelve boilers was about 26,000 lbs. On this same vessel, to solve the problem of protecting the protective deck above the boiler compartments from the radiant heat of the boilers required another bureau to build a false deck some 18 in. below the protective deck with special ventilation arrangements to maintain a current of cool air between the false work and the protective deck. This work weighs 32,500 lbs. and still leaves the hot air below it to be dealt with by other means.

"The artificial ventilation on the recent United States naval vessels is a departure from the older methods, the vessel being divided up into many systems each providing ventilation for a certain section of the vessel and proportioned in capacity to the requirements of that section, the principal object of this arrangement being, I think, to avoid cutting through the main bulkheads with large air ducts, requiring as they do automatic valves, and perhaps less loss through friction in the longer ducts, necessary where there are fewer units in the installation. The objections to the new method are, that if any ventilation is required over the whole ship, every fan must be in operation to get it, although the amount required may be very little; the independent system being fitted over the whole length of the ship requires that inlet cowls be fitted all over the upper decks. At the ends of this vessel this presents many difficulties which will render some of the systems inoperative when most needed. I find on the forward upper deck of a battleship just completed, besides a number of small cowls, one 36-in. cowl on each side, just forward of the turret. In very ordinary weather, when the hatches would be closed, these cowls would have to be removed and the watertight covers fitted on the openings; they must also be removed to operate the turrets, and in action they would have to be removed and the battle covers fitted. These open-

ings supply air to the fans that ventilate the berthing spaces forward of the turrets on that vessel. Thus, at the time when the hatches are closed and air ports are closed, and ventilation is mostly required, it is entirely shut off. All ventilation aft on the same ship is in the same condition, when the circumstances are the same. Ventilation of engine rooms is rendered difficult by having to get air to fans through engine room hatches generally far too small to let the hot air escape.

"I propose to solve the ventilation problem, like many other problems, through the central passage. As stated in the description and shown on the plan and inboard profile, the passage widens to 15 ft. between frames 35 and 40. Above this widened portion and between frames 37 and 40, an air trunk 12 ft. extends to the upper or boat deck, close behind the shield of the conning tower. The upper part under the bridge receives air through adjustable louvres fitted on all sides. In very rough weather when spray might reach the bridge deck, the louvres might be closed on the weather side. At the base of this fresh air trunk, in the widened part of the passage, there would be installed six electric fans, each having a capacity of 15,000 cu. ft. of free air per minute, or 90,000 in all. The air trunk is divided into six compartments at the base to provide an independent suction for each fan, each provided with an air-tight shutter to close the opening when its fan is not running. The fans would deliver directly without casings into the passage. About one ounce air pressure would be maintained constantly in the passage and the necessary number of fans kept running to maintain that pressure. The central passage forms the main air duct for the whole ventilation of the ship. All compartments requiring artificial ventilation, except the boiler compartments, will receive the air necessary for that purpose from the central passage. From the roof or sides of the passage, air ducts will extend to the determined point of delivery. This includes the main engine rooms and the dynamo rooms. All openings into the ducts will be closed by watertight gates operated in the passage. These gates or valves will be opened or closed by the man in charge of ventilation in the passage, on order from the compartment or room to be ventilated. In living spaces the air would be delivered not far from the floor or deck of the compartment being ventilated, through a special type of louvre (see plan 4), arranged to stand close to the bulkhead and with slats to direct the air to any part of the room or compartment, as required. For all living spaces, the outlets from the central passage would be small, so that each room or compartment would have its own independent connection with the air supply. This is necessary in connection with another part of this arrangement, whereby the steam heater arrangement or radiator system is combined with the ventilation. At each outlet taking air to living quarters and berthing spaces a special radiator (see plan 5) is fitted. This is combined with the shut-off valve, being a double coil, circular in form, made without joint, and so arranged that the air on its way through the outlet must pass over the surface of the pipe forming the coil and thus becomes heated. This forcing the cold air over the steam heated surface of the radiator would be very effective and enable the surface, in proportion to the space to be heated, to be very much reduced from that of the ordinary radiator. The amount of steam applied to the radiator would be regulated by the man in the central passage in charge of the heating system, as ordered from the rooms or spaces requiring hot air. Each room or space can thus be kept at the temperature required by the occupants, the steam pipes to and the drain pipes from the heaters would all be installed in the central passage and in charge of the man assigned to the duty of taking care of the heating arrangements. This removes a lot of steam pipes and fittings from the living spaces in the ship, where they are a continual source of

trouble, and usually, to a large extent, very difficult to get at for repairs, and placing them where they will be always in sight, and in unobstructed lines where repairs and renewals can be made with the least trouble and expense.

"Most of the air duct work under the gun deck would be of lap-welded tubing, and as it would be largely vertical from the roof of the central passage, there would be little difficulty in installing it so as not to interfere with the structural work of the vessel.

"Besides the simplicity of this arrangement, there are many other advantages. The number of fans in operation will always be just that required to keep the necessary air pressure in the passage. This, of course, will always be considerable, as the main engine rooms and dynamo rooms will require a steady volume of considerable amount; but as these compartments will receive the fresh cold air on their lower floor levels, making all hatch and casing outlets upcasts for the discharge of hot air, better results will be secured with a less volume of air blown in than with the present system. The upper decks will be entirely relieved from ventilation pipes and cowls, which, in many cases, as already pointed out, have to be unshipped and closed up when most required. The whole ventilating and heating machinery is located where it can all be cared for and kept in good order with the minimum amount of work.

"Certain places, such as water-closets, laundries, and possibly pantries, are better ventilated by having the foul air removed by suction than having it displaced by blowing fresh air in. In such cases I would either cause an induced draft in the outlet from such places by blowing air through a suitable induction nozzle in the base of the outlet, where the outlet is properly located and a suitable form possible, or install in such places a small suction fan, as is usually done now; but I do not consider it necessary to extend ducts and branches to every corner and division where it is possible to get in a pipe. A suction fan properly placed and the fresh air inlets to such places properly disposed with relation to the fan is, in my opinion, all that is necessary for satisfactory ventilation.

INTERIOR COMMUNICATION.

"I expect to be able to simplify by means of the central passage much of the means of interior communication. Much of it can also be simplified without any special feature in the ship construction being introduced. Doors and hatches come under this designation. I have never been able to discover the necessity of installing complicated mechanism, either electric, pneumatic or hydraulic, to operate a door or hatch. There is no special difficulty in making such a door or hatch that will work satisfactorily and go through all the prescribed tests and that will continue to do so, if kept in proper order and under the care of an expert, but the location of the most important of these doors being in the dust and grit of the fire rooms, their chance of being properly cared for is very small indeed. I have studied the power operated door question very thoroughly, and, I think, have succeeded in making a door as simple as a power operated door that can be operated at a distance can be made, but I have always considered the time and thought spent on the problem as, in a certain sense, wasted, as all such devices are bound in a very short time to be discarded, simply because they need so much care and attention and they are not really necessary, and because of that fact are more or less neglected. When it is understood that a door or hatch can be operated well enough if its complicated mechanism fail, much time will not be spent in caring for the mechanism.

"This is very well understood on the ships and also on shore. In a report made lately on the tests of a door made at Washington, comparing its working with that of another

door representing the type now being fitted to most of the vessels of the navy, it is stated that the doors tested, as compared with the other, was simpler in construction, was tight, would stand ordinary neglect better, but would not stand gross neglect so well. This is a very clever report, and the construction of the words is quite as hard to understand as the mechanism of the power door operated from a distance.

"As to power operated hatches, the standard size of hatch in protective decks is 30 in. by 30 in. and never over 4 in. in thickness. These can readily be lifted by hand mechanism and by one man, or they can be lifted by ordinary whip tackle by two men. The elaborate electrical mechanism now fitted to a number of these hatches is quite unnecessary, as one man is needed to operate the electric gear, and he could just as well use his own power as that of a motor. The operating gear for one of these hatches costs, installed, about one thousand dollars, and requires continual care and attention to keep it in working order, occupies room, which is always scarce around a hatch, and adds to the general complication. Besides, in case it should fail, the mechanism is still further complicated by the addition of hand gear to that of the electric.

VOICE PIPES.

"Since the advent of the telephone, voice pipes have been discarded in the modern buildings, and they should also be discarded in the modern warship. The telephone has been brought to such perfection so as even to speak out loud, that there be no doubt as to its reliability on board ship. The number of voice tubes now required on one of our armored cruisers, if placed side by side with 1 in. space between them, occupy a width of 60 ft., whereas the wires for as many telephones could be installed inside one of them.

"The central telephone station would be installed in the central passage, directly under the conning tower, where there would be a switchboard for making connection from any part of the ship to any other part of the ship. Here also orders would be received regulating all matters under control in the passage. There would always be one man on watch in the central station, who would have a messenger to carry orders to any of the men in charge of work in the passage. It might be necessary to run the telephone lines from the bridge to the engine rooms, and from the conning tower to the turrets direct, instead of through the central station; but all other telephone service would go through the central station. From all points having telephone connection the wiring would be carried as direct as possible to the central passage and horizontal leads carried in the passage.

"The call-bell system would be installed very much as it is at present, except that a complete telephone system, as described above, would very much reduce the number of call-bells, the call for personal service being about all that would be necessary.

"Engine room telegraphs and revolution indicators should be limited to one kind, and whether fitted as mechanical or electrical, they should be the best that could be devised. The mechanical instruments as now fitted, I believe to be the best and most reliable, and when direct telephone communication is also provided between the bridge and engine rooms, orders for any and all varieties in speed can be readily communicated. The mechanical revolution indicator simply continues the motion of the engine shaft to the bridge. The small shafts for that purpose would pass directly from the engine rooms into the central passage and run in a direct, straight line to the armored tube under the conning tower and through that to the stations where engine room telegraphs are installed. The dials for engine revolution indicators would be a part of the telegraph stand and would be properly illuminated. All wire leads for the engine room telegraphs would be carried

in straight lines from base of the armored tube to the engine room through central passage.

BATTLE ORDER TRANSMITTERS AND RECEIVERS.

"I find opinions very much divided among naval officers as to the value of these instruments. Their vocabulary is very limited, and many officers are of the opinion that should they remain operative in action they are more apt to retard than help the efficient operation of the guns. They add to the complication of the wiring, as the most recent applications of this means of communication involve so many instruments each representing two wires for each order it is designed to transmit, the result being an addition of two or three miles of wire to an already large total. I would propose that the wiring for these instruments should be carried down through the armored tube, which I may state here should be large enough to install all work to be carried through it on its walls, leaving a clear space in the center sufficiently large for a man to ascend from the central passage to the closing plate at the conning tower floor for examination and repair. From the base of the tube the wires for battle order instruments, bunched together or in cables, would be carried to points directly under the instruments they are to connect and pass up from the passage in as nearly vertical leads as possible. This gives less chance of their being destroyed in action, and for nearly their whole length they are open to view and readily got at.

"Instruments that give warning of undesirable conditions in the compartments where they are installed, such as thermostats; are of very doubtful utility on board ship. In coal bunkers, should fire occur some distance from the location of the thermostat, there might be no material rise in temperature at the instrument and no alarm given. They have, however, given warning when the fire was close enough to them to raise the temperature sufficiently to make them operative. In magazines, where a dangerous rise in temperature is apt to be about the same all over the magazine, they should be fitted. They would be wired to the central passage and the connections installed there. Other means of communication, such as fire alarms, calls to quarters, etc., would be operated from the central passage by telephone order. This would save much wiring and all that fitted would be vertical.

STEERING GEAR.

"In the outline plan of an armored cruiser that accompanies this paper, I have shown electric steering gear. This has been done not because I think that the steering gear can be better done by electric power than by either steam or hydraulic gear, but because I think steering can be equally well done by properly designed machinery by either of the three methods named, and because all auxiliaries on board naval vessels are now operated electrically except the steering gear and windlass, yet these two exceptions involve the installation of steam pipes from one end of the ship to the other. To operate the steering gear by electric power presents a no more difficult problem than the training of a turret, perhaps less, and electrically operated turrets have replaced, in our navy at least, both steam and hydraulic power for that purpose. The windlass can just as well be operated electrically as a boat crane. With the steering and anchor gear operated by motors, no steam pipes would be required outside of the main engine and boiler room enclosures. These steam pipes, especially those running aft to the steering gear, which are constantly in service when the vessel is under way, are not only troublesome to keep in order but cause considerable heat, which, added to that caused by the steam engines in the steering room, render special ventilation provisions necessary.

"The steering gear I have shown is operated by two motors. Through any movement of the rudder up to 15°, port or starboard, one motor only would be in operation; beyond that

both motors would be switched into work. The gearing would be arranged as shown so that the length of arm is increased as the rudder goes over. The controller would be installed in the armored tube under the conning tower, the controller shaft extending directly up through the conning tower to the pilot house and the upper bridge. A simple lever would be used to make contact in the controller, with a spring arrangement to bring it to the off position. The cables between the controller and the motors on the steering gear would be carried direct along the central passage to the motors. From the rudder head a shaft would be carried along the roof of the central passage, and up through the armored tube to each steering station operating helm indicators, which I would propose to make with vertical arms, the arms being the full height of the stand, or, say, about 3 ft. This would give a large movement at the end of the arm, showing the slightest movement of the rudder. In steering, the controller handle would be operated entirely by the movements of the indicator. This would be very simple and practically the same as training a turret. Keeping the vessel on her course would require simple momentary contacts with the first fingers as required. Hard-a-port or hard-a-starboard would, if to be done quickly, require the full movement of the controller handle, which would be thrown to the off position by the indicator gear when the rudder was over, should the operator neglect to release his hold. The hand steering gear would be arranged, as usual, aft. Steering telegraphs should be of the mechanical type, and, I think, should consist of a small steering wheel at each steering station, which, by means of steering ropes carried through the armored tube and along the central passage to the steering room aft where the hand gear is installed, would operate a pointer, the arm of which should be about 3 ft. long and placed directly behind a similar arm of the rudder indicator gear. It would then be the business of the man operating the hand gear on the electric gear aft to keep the two pointers always over each other. By that means the actual steering would be done from the bridge, conning tower or wherever a steering station was established. This, I believe, to be the proper steering arrangement where electrical power is used for all auxiliaries. When operating the electric gear aft in the steering room a separate controller installed in the steering room would be used. All the transmission gear would be installed in the central passage with straight leads and all parts accessible and in view at all times.

FIRE AND FLUSHING ARRANGEMENTS.

Fire and flushing arrangements and fresh water supply requires some consideration of the pumping appliances to be provided for such a vessel, and in the scheme now being considered I propose to do away with all pumps such as auxiliary feed, fire and bilge pumps, for reasons already set forth in connection with drainage, and adhere strictly to providing pumps with one duty to perform, and designed expressly for that duty. All steam pumps I propose to install in a pump room, extending across the vessel between the main engine rooms and the after fire rooms. The longitudinal center line bulkhead would divide this space into two compartments; the pumps installed in each of these compartments would be duplicates of each other. The auxiliary condensers with their air and circulating pumps would be installed on the outboard side of each pump room; they would also take the steam from the dynamos above. There would be a special fire pump in each pump room, designed for the purpose of maintaining a pressure in the fire mains of say 250 lbs. per sq. in., and for the vessel we are considering, to have a capacity of 600 gallons per minute. These pumps would take water from a sea stool or chest in the pump compartment and deliver into a fire main in the central passage extending practically its whole length.

This main would be 7 in. in diameter, the diameter being reduced toward the ends as branches were taken out. The branches or stand pipes would rise vertically from the fire main, and in size would be suited to the number of hose connections that they supplied. They would be arranged, if possible, close to the main bulkheads, so as to supply hydrant valves on each side of the bulkheads. This would reduce the amount of piping and avoid as much as possible horizontal pipes outside of the passage. No other pumps except the two main fire pumps would connect to the fire main, and these pumps would draw water only from the sea.

"In each pump compartment there would be installed a flushing or sanitary pump with a capacity of 350 gallons per minute. This pump would take water from the same sea stool or chest as the fire pump and deliver into the flushing main, which would extend the whole length of the central passage. This would be 5 in. in diameter. The flushing pipe would be arranged with a loaded valve and by-pass to maintain a constant pressure of 50 lbs. per sq. in., and thus provide a constant service to all parts of the ship, dispensing with all tanks. The pumps would be designed especially for this service and so as to run very easy at full capacity.

"All connections to bath rooms, water closets, etc., would be made through vertical pipes from the main in the passage. All water-closets would be of the low back, house type, but with all fittings to suit a salt water service. Circulating water for the distillers would be taken from the flushing main and discharged overboard or returned to the main at a less pressure, if desired. Magazines above the water-line would also be flooded from the flushing main. Magazines below the water-line would be flooded by special arrangements as they are now. By this arrangement all plumbing and sanitary work would be arranged just as it is for a city waterworks system, except that the water would be salt instead of fresh. In the branches leading up to such bath-rooms as should have hot water, arrangements would be provided in the central passage for heating the water as required from the heater system, a coil being used for that purpose so as to avoid any loss of fresh water from the boilers. The party ordering the water from central passage would give the temperature required. Hot water would be arranged for officers' baths and sick bay only. The engine room water service would also be taken from the flushing main by a branch direct from the pump discharge before it enters the central passage.

"In each pumping compartment there would be installed a fresh water pump of say 75 gallons capacity each. These would take water from the fresh water tanks and deliver into a fresh water main pipe in the central passage, extending as far as the vertical distributing pipes require. A pressure of say 40 lbs. per sq. in. would be maintained at the pump constantly by a carefully adjusted relief valve and by-pass combined with an automatic steam regulator. There would be distributing pipes to the kitchen, the ice-making plant, the scuttle butts, the pantries and to such bath-rooms, including wash rooms, as fresh water is allowed to. On each distributing pipe in the central passage there would be a water meter and a record kept of the amount of fresh water used at each point where fresh water is delivered. All piping for this system would be of galvanized iron.

"In each pump compartment there would be installed two boiler feed pumps, each capable of delivering to the main feed pipes at an easy speed of 450 gallons per minute, which would enable one feed pump in each compartment to supply the necessary amount of feed water at full power, leaving a complete spare set of feed pumps at full capacity. These pumps should be long stroke, moderately slow running pumps, very substantially built. They would take water from the feed-water tanks on their own side of the vessel and deliver into the main feed pipe on their own side of the middle line bulkhead. The feed pipes would be carried under the floor

of the central passage. Each feed pipe would connect by branches, having a stop valve at the junction with the main pipe with the boiler check valves. I have shown in the design accompanying this paper double ended Scotch boilers, not for any purpose of discussion, but simply because I expect to live to see them again the standard type in naval vessels. The set of boilers shown in this design are not any heavier as a whole than Babcock & Wilcox water-tube boilers of the same power would be, and they take 8 ft. less length of the ship to install and 2 ft. less width, which means considerably more coal bunker capacity. They are shown fitted with the Howden system of forced combustion, which is admirably adapted to this form of boiler. Each boiler is a complete unit with its own blower for the forced draft, the whole being designed for a maximum of 24,000 H. P., the steam pressure being 200 lbs. per sq. in.

"To return to the main feed pipes, there would be a feed check valve on each end of each boiler connecting by branch to the main feed pipe in its own compartment. Two hundred and twenty lbs. pressure would be maintained in the main feed pipe, and a carefully fitted relief valve in the pump compartment would return the water pumped that did not find its way into the boilers to the suction side of the pump. Closely allied with the feed pumps and their connections to the boilers are the feed water heaters. As now fitted they are heavy, elaborate affairs, involving many pipe connections and valves, and have considerable heated surface to raise the temperature in their vicinity. In order to get any good result from them they have to be worked under considerable back pressure. This lowers the efficiency of all auxiliaries exhausting into the auxiliary exhaust pipe, the temperature of the steam in which determines the efficiency of the feed water heater. I am inclined to think that it would be quite as economical to dispense with the heater as now fitted and exhaust all auxiliaries direct into the auxiliary condenser, and provide a simple heater drum to receive the feed water from the pumps, and having a steam coil fitted, the coil to take steam from the first receiver when the engine was working at high power and from the boilers when the engine was working at low power, and by this simple means raising the feed water temperature to the most desirable point for the good of the boilers. This would be very much simpler, and taking into account the large auxiliary power on these vessels that would be relieved of back pressure, would, I think, be quite as economical.

"By the arrangement of pumping I have just described there would be in the engineering department, and installed in the port and starboard pump rooms, ten pumps, consisting of four feed pumps, two fire pumps, two low service salt water pumps, and two low service fresh water pumps. No other pumps are required and no others should be fitted. The piping, valves and connections are reduced to a minimum, and on that account can be made amply strong and of the most durable materials. I have endeavored to break away from the traditions of the engine room in regard to pumping matters, and have provided only for just the actual functions that have to be performed, and I am sure that if engineers will approach this subject in the same spirit as I have, they will reach the same conclusion."

The newspapers last week published an item to the effect that the turbine engines of the Allan liner *Victorian* had proved a failure in endeavoring to develop the contract speed. The item was fabricated wholly, as the *Victorian* is not yet complete and will not have her trial until next February.

The Staples & Stimson Construction Co., Portland, Me., has received an order from the government for the construction of ten surf boats for the life-saving service.

AROUND THE GREAT LAKES

The steamer Francis Robbins, building for Mr. W. H. Becker of Cleveland, will be the next steamer to be launched by the American Ship Building Co.

Abram Smith & Son, Algonac, Mich., are making repairs upon the steamers Uganda, Simon Langel, the package freighter Wyoming, Flint, Ida E. and Owen; also the schooners Houghton, W. K. Moore, Arenac and Interlaken.

The big freighter building for the Acme Steamship Co. of which Mr. A. B. Wolvin of Duluth is president and general manager will be named in honor of Mr. J. C. Wallace, president of the American Ship Building Co.

The White Star Line of Detroit has closed contract for the construction of a new steel warehouse on the river front on the west side of Griswold street for the accommodation of passengers and freight of the Toledo division of the line.

Mr. George Towne of Buffalo has been appointed by the quartermaster's department of the United States army to take charge of the engine room of the harbor supply ship Baker stationed at Barranco, Fla. A salary of \$1,800 per annum is attached to the position.

Col. Charles E. L. B. Davis, United States engineer with headquarters at Detroit, has recently inspected the work of excavating the new channel westward of Neebish Island, St. Mary's river. Reports that the work is progressing finely and indications are that the contract will be finished well ahead of time. McArthur Bros. of Chicago are the contractors.

Supt. A. A. Schantz of the Detroit & Cleveland Line, the Detroit & Buffalo Line and the Cleveland & Toledo Line has announced the mileage of the eight steamers of the three passenger lines during the season of 1904 as 258,619. This is considerably less than the mileage of the two preceding years caused by the late opening of navigation through weather conditions and labor troubles.

The Minnesota naval reserve, located at Duluth, has engaged the services of Harry Hutchins, first mate of the steamer James H. Reed, who formerly held a chair in the Chicago Nautical college, to give the officers of the two Duluth divisions a course of instruction in navigation of the great lakes, particularly of Lake Superior. Mr. Hutchins' reputation as a navigator is excellent.

Charles F. Bielman who has the contract to deliver the mail to the passing boats in Detroit river has given an order to the Pongs-Finch Gas Engine Co. for the construction of a new mail boat to replace the Florence B. which was badly damaged in a collision with the steamer Spokane a few weeks ago. The new boat will be 70 ft. long, 14 ft. beam and 5 ft. deep. She will have a fore and aft compound engine.

The steamer Soo City, owned by A. Booth & Co., and during 1904 in service between Chicago and South Haven, operated by the Michigan Steamship Co., is laid up for the winter at Ferrysburg, Mich. This steamer will go to Lake Superior early next season, and will, in conjunction with the steamer America, make daily trips between Duluth and Port Arthur, Ont. Extensive alterations are being made, including the installation of new Scotch boilers.

The United States & Dominion Transportation Co., better known as the Booth Line, has about completed next season's plans for a semi-weekly service between Duluth and Sault Ste. Marie, on Mackinac Island. The loss of their steamer Hunter last October, which ran between Sault Ste. Marie and Munising, will be replaced by a larger boat, and in conjunction with their steamer C. W. Moore, in service during the past two seasons between Duluth and the copper country, will make the entire Lake Superior south shore route.

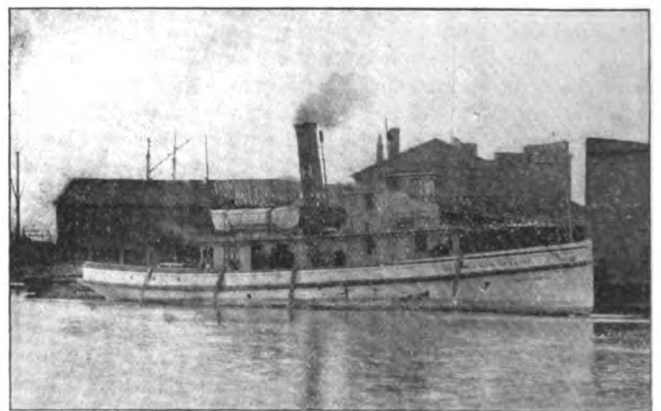
Mr. Harry Coulbly, president and general manager of the Pittsburg Steamship Co., will meet the masters of his fleet this week and the engineers next week. It is not expected

that there will be any trouble in reaching a satisfactory agreement for the season of 1905. As far as can be learned the masters are done forever with the late organization of the Masters' & Pilots' association and the engineers have always been well treated, so that no cause for grievance is known to exist. Considering the rate of earnings the operating expenses during the past season have been quite high, but there is no talk of any reduction.

The steamer Iron Duke of the Corrigan fleet was destroyed by fire at Charlotte, N. Y., last Sunday night. She had been laid up at Charlotte for the winter, having delivered her last cargo to the furnace operated by Corrigan, McKinney & Co. at that point. The fire started in the engine room and the whole after part of the vessel was burned to the water's edge. Only her smokestack now shows above the water. The Iron Duke was built by the Detroit Dry Dock Co. in 1881 for the Detroit Transportation Co. and was purchased by Mr. Corrigan seven years ago. She was 212 ft. keel and 35 ft. beam and had a carrying capacity of 1,700 tons of ore. She was insured for \$40,000.

Mr. Wm. Livingstone, president of the Lake Carriers' association has sent to every vessel owner on the lakes a copy of the new steamboat regulations as framed by the board of supervising inspectors at Washington. Contrary to the popular report these regulations have not been approved by Secretary Metcalf of the department of commerce and labor and therefore are not as yet in effect. It is the desire of the secretary to hear objection to the regulations and he has extended the time wherein objection may be made until Jan. 16. As these regulations affect the lakes as well as the ocean it would be well for vessel owners to see that they are properly represented at Washington before the recommendations are finally approved.

In his dealings with employers the great strength of Mr. D. J. Keefe, the president of the International Longshoremen, Marine & Transport Workers' association, lies in the fact that he can be relied upon to live up to a contract. For this reason he has just notified President Livingstone of the Lake Carriers' association that four members of the Marine Firemen's union have been forever expelled from that organization for violating the agreement made between the Lake Carriers' association and the Marine Firemen last spring. The complaint on which they were expelled was made by Mr. Harry Coulbly, president and general manager of the Pittsburg Steamship Co., who claimed that the four men had refused to work upon the steamer Colgate on Dec. 4 and 5 with the result that the steamer was held up for two days. President Keefe says that any member who violates a contract will receive similar treatment.



FOR SALE.—American bottom tug, Mary P. Hall, for lake and river service; American bottom tug, Curlew, for river service; American bottom barges, Black Diamond and Argosy; Canadian bottoms, Mohawk and Onondaga. All wintering at Ogdensburg, N. Y., where they may be inspected. For prices and terms apply to Geo. Hall Coal Co., Ogdensburg, N. Y.

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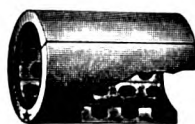
French Navy	-	-	-	-	-	-	-	355,560	H. P.
English Royal Navy	-	-	-	-	-	-	-	966,300	"
Russian Imperial Navy	-	-	-	-	-	-	-	224,500	"
Japanese Imperial Navy	-	-	-	-	-	-	-	122,700	"
Austrian Imperial Navy	-	-	-	-	-	-	-	56,700	"
Italian Royal Navy	-	-	-	-	-	-	-	13,500	"
Chilian Navy	-	-	-	-	-	-	-	26,500	"
Argentine Navy	-	-	-	-	-	-	-	13,000	"
The "Messageries Maritimes" Company	-	-	-	-	-	-	-	87,600	"
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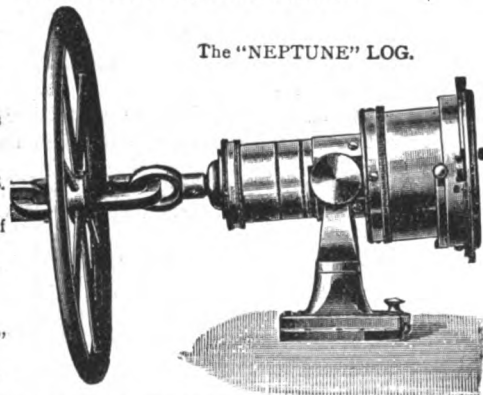
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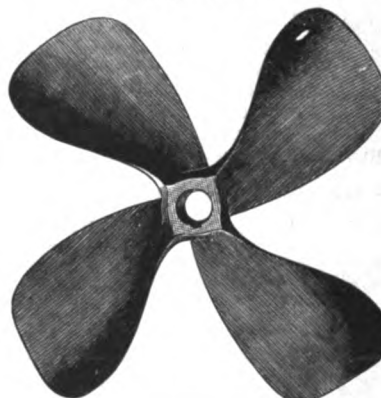
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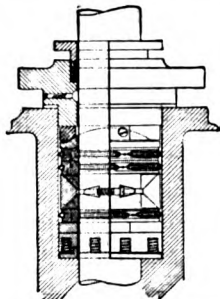
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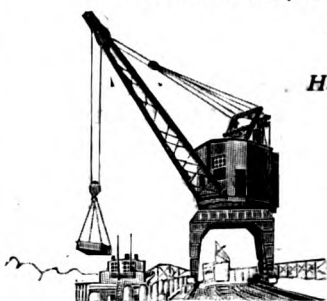
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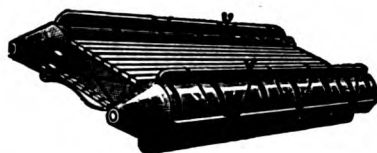
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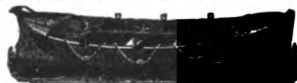
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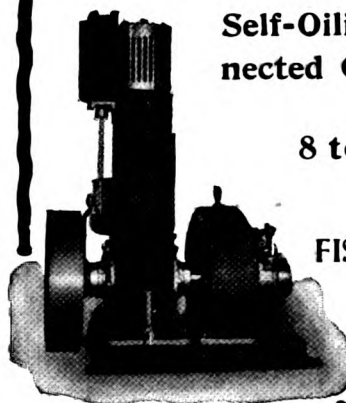
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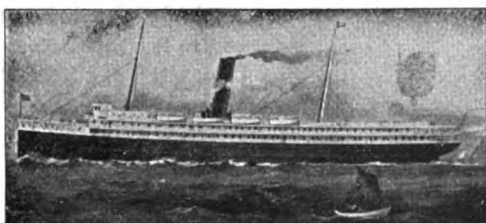
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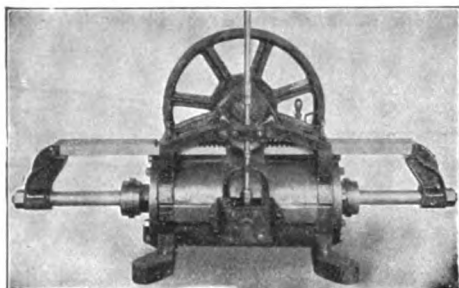
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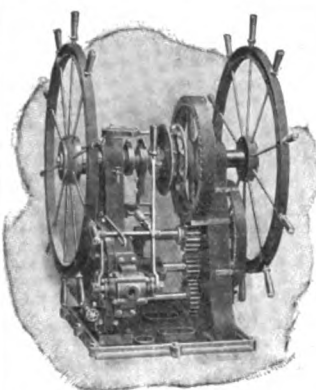
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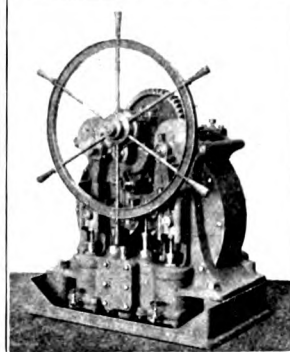
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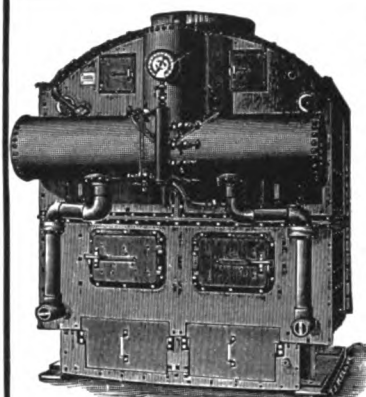
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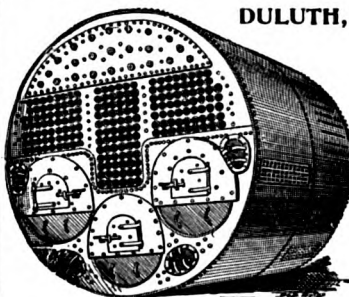
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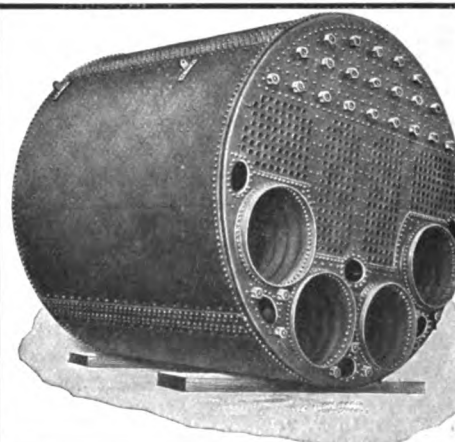
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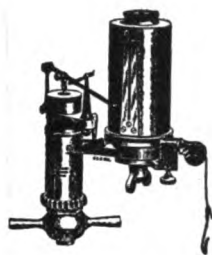


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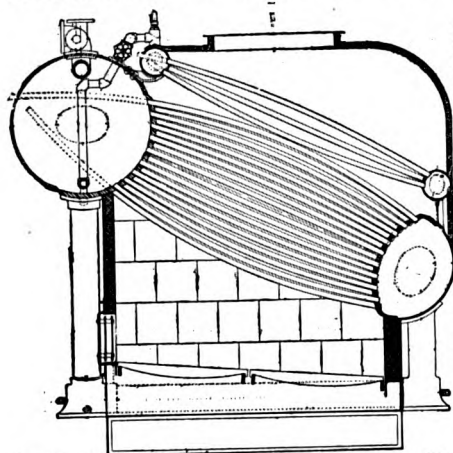
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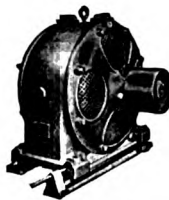
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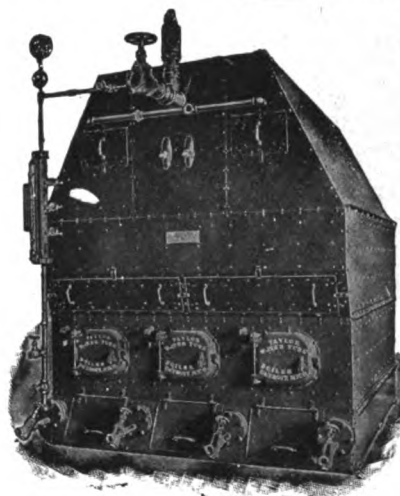
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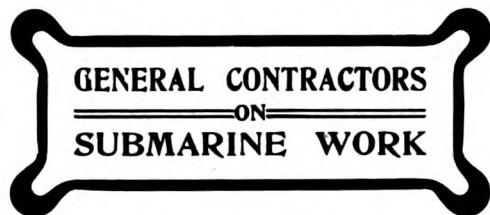
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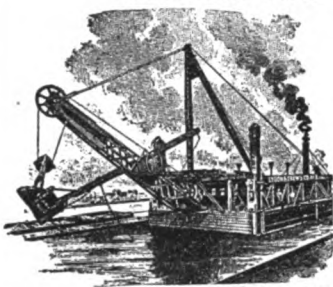
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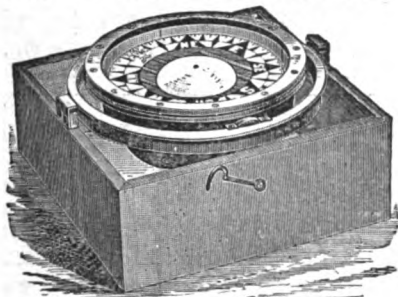
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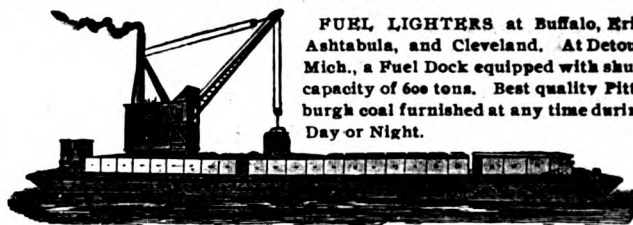
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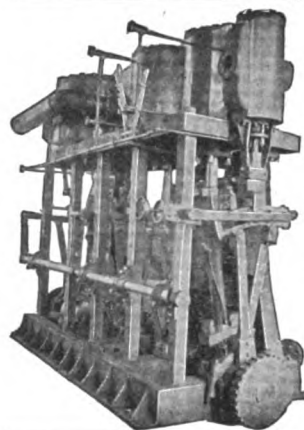
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New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.
Georgian Bay Engineering Works.....Midland, Ont.
Reliance Mfg Co.....Providence, R. I.

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American Steam Gauge & Valve Mfg. Co.....Boston.
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GAUGES, WATER.

Bonner & Co., Wm. T.....Boston.
Lunkenheimer Co.....Cincinnati, O.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Hyde Park, Mass.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
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Mietz, Aug.....New York.
Pawling & Harnischfeger.....Milwaukee.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

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Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

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Great Lakes Engineering Works.....Detroit.

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Watson-Stillman Co., The.....New York.

ICE MACHINERY.

Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

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American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co.....Chicago.
Jenkins Bros.....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

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Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H.....Chicago.
Frankfort Marine, A. & P. G. Ins. Co.....New York.

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Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
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Peck, Chas. E. & W. F.....New York & Chicago.
Prindiville & Co.....Detroit.
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Sullivan, D. & Co.....Chicago.
Voss, F. D.....New York.

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Reading Iron Co.....Reading, Pa.

IRON ORE AND PIG IRON.

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Hanna, M. A. & Co.....Cleveland.
Picklands, Mather & Co.....Cleveland.
Reading Iron Co.....Reading, Pa.

LAMPS, INCANDESCENT.

Westinghouse Elec. & Mfg. Co.....Pittsburg, Pa.
Sawyer-Man Electric Co.....Pittsburg, Pa.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Georgian Bay Engineering Works.....Midland, Ont.
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General Electric Co.....Schenectady, N. Y.
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Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

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Chicago Nautical School.....Chicago.

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 Kreer & Parsons.....Chicago.
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 Matteson & Drake.....Philadelphia.
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 Nacey, James.....Cleveland.
 Rice, Henry.....Buffalo.
 Sadler, Perkins & Field.....New York.
 Wood, W. J.....Chicago.

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DeGraw, Aymar & Co.....New York.
 Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.

Mietz, Aug.....New York.

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 Jenkins Bros.....New York.
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 Sullivan, M.....Detroit.

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 Macbeth Iron Co.....Cleveland.
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 Otis Steel Co.....Cleveland.
 Reading Iron Co.....Reading, Pa.

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 Fore River Shipbuilding Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
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 Jenks Ship Building Co.....Port Huron, Mich.
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 Milwaukee Dry Dock Co.....Milwaukee.
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 Roelker, H. B.....New York.
 Sheriffs Mfg. Co.....Milwaukee.
 Superior Ship Building Co.....Superior, Wis.
 Thropp & Sons Co., J. E.....Trenton, N. J.
 Trout, H. C.....Buffalo.

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 Kingsford Foundry & Machine Works.....Oswego, N. Y.

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Great Lakes Engineering Works.....Detroit.
 Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.
 Record of American & Foreign Shipping.....New York.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)

Georgian Bay Engineering Works.....Midland, Ont.

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Allen, John F.....New York.

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Bourne-Fuller Co.....Cleveland, O.

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 Ashton Valve Co.....Boston.
 Crane Co.....Chicago.
 Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
 Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SCHOOLS—NAVIGATION.

Chicago Nautical School.....Chicago.

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General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

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 Otis Steel Co.....Cleveland.
 Reading Iron Co.....Reading, Pa.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bertram Engine Works Co., Ltd.....Toronto, Can.
 Buffalo Dry Dock Co.....Buffalo.
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 Craig Ship Building Co.....Toledo, O.
 Chicago Ship Building Co.....Chicago.
 Detroit Ship Building Co.....Detroit.
 Fore River Shipbuilding Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Maryland Steel Co.....Sparrows Point, Md.
 Milwaukee Dry Dock Co.....Milwaukee.
 Newport News Ship Building Co.....Newport News, Va.
 New York Shipbuilding Co.....Camden, N. J.
 Roach's Ship Yard.....Chester, Pa.
 Shipowner's Dry Dock Co.....Chicago.
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Baker, Howard H. & Co.....Buffalo.
 Marine Mfg. & Supply Co.....New York.
 Upson-Walton Co.....Cleveland.

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 Kreer & Parsons.....Chicago.
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 Rice & Lovejoy.....Buffalo.
 Steel, Nacey & Hynd.....Cleveland.
 Wood, W. J.....Chicago.

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 Red Star Line.....New York.
 United Fruit Co.....Boston.

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 Otis Steel Co.....Cleveland.

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 Chase Machine Co.....Cleveland.
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 Lovejoy, H. O.....Buffalo.
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 Nacey, James.....Cleveland.
 Rice, Henry.....Buffalo.
 Steel, Adam.....Cleveland.
 Wood, W. J.....Chicago.

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 Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

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 Chase Machine Co.....Cleveland.

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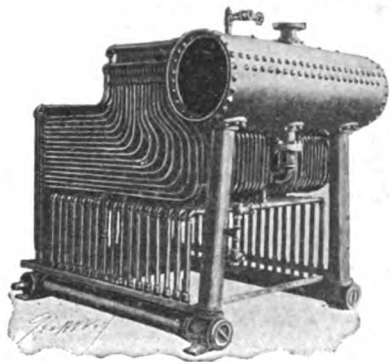
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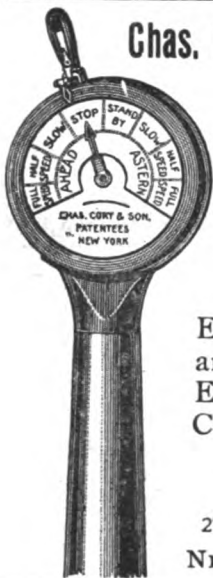
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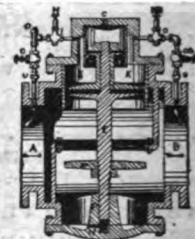
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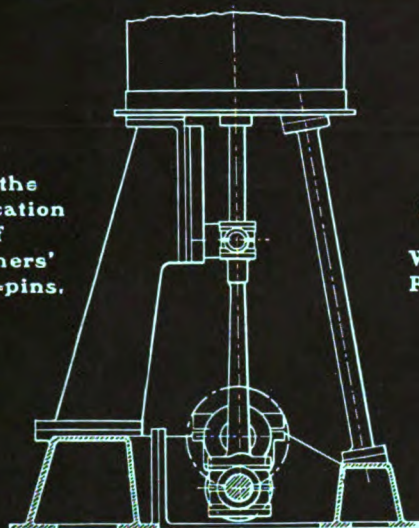
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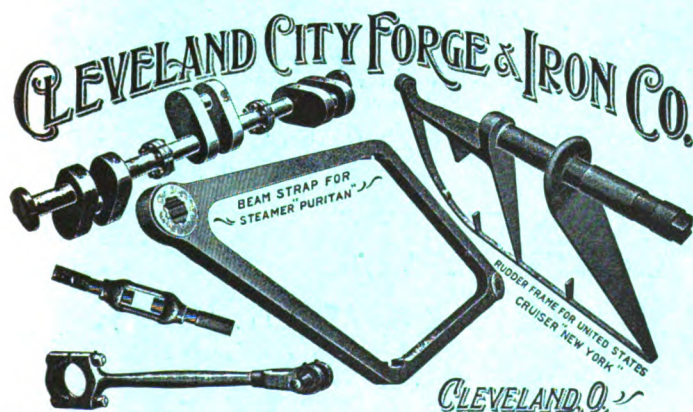
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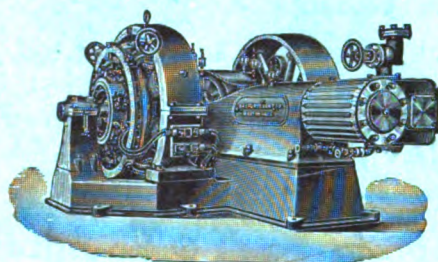
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No. 40, Toledo and Buffalo Accom. .	†10:00 a.m.	†10:30 a.m.
No. 32, Fast Mail	*11:25 a.m.	*11:30 a.m.
No. 48, Accommodation via Sandusky	†1:40 p.m.
No. 42, Boston-New York Express	*11:45 a.m.
No. 44, Cleveland and New York Spl.	*3:00 p.m.
No. 46, Southwestern Express	*3:10 p.m.
No. 116, Ashtabula Accommodation.	†4:30 p.m.
No. 6, Limited Fast Mail	*5:40 p.m.	*5:45 p.m.
No. 26, 20th Century Limited	*7:40 p.m.	*7:43 p.m.
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Westward	Arrive from East	Depart West
No. 7, Exposition Limited	*12:50 a.m.
No. 11, Southwestern Limited	*2:55 a.m.
No. 9, Day Express	†6:10 a.m.
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No. 29, Southwestern Special	†11:10 a.m.
No. 33, Southwestern Express	*12:25 p.m.
No. 133, Cleveland and Detroit Exp.	*12:45 p.m.
No. 47, Accommodation	†11:00 a.m.	†3:00 p.m.
No. 141, Sandusky Accommodation	†3:10 p.m.
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No. 127, Norwalk Accommodation	†5:10 p.m.
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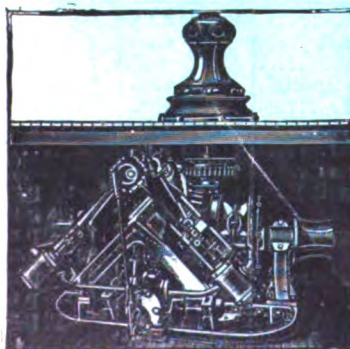
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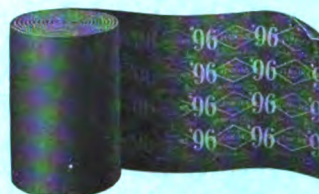
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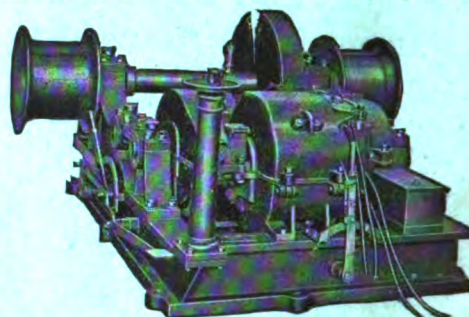
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